

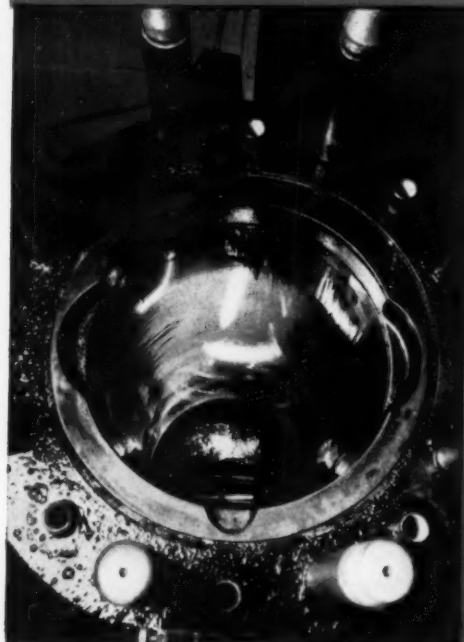
# DIESEL PROGRESS



JANUARY, 1943

FIVE DOLLARS PER YEAR—FIFTY CENTS PER COPY

# 10,595 HRS. WITH THESE RESULTS



Free Rings

No Visible Cylinder Wear

Bearing Condition—Excellent

Entire Engine Carbon-Free

LOOKING DOWN cylinder of No. 3 Diesel just after piston was pulled for inspection. Note smooth, fine finish on walls, after 10,595 hours operation! Lubricant: *Texaco Ursa Oil*, of course. (Right) Piston just as it appeared when removed from engine. All rings free, no hard carbon, no plugged oilways. Out of 10,896 hours, engine had only 301 hours idle time. Always delivered full power.

Boise King Placers' 7½-ft. bucket-type, electrically operated dredge at Twin Springs, Idaho. Power furnished by three 6-cyl. 4-cycle, 300 hp. Union Diesels, all lubricated with *Texaco Ursa Oils*.

**D**REDGING a river bed 80 miles back in the mountains, away from big city facilities, Boise King Placers depends upon uninterrupted power supply from its three 300-hp. Union Diesels . . . assures it by lubricating with *Texaco Ursa Oils*.

The excellent condition of the piston and cylinder shown here, after 10,595 hours steady operation, is typical of *Ursa's* performance.

In addition to free rings and exceptionally low cylinder and bearing wear, Chief Engineer H. H. Crabb reports low oil consumption, sludge-free crankcases, complete absence

of blow-by. Because so many Diesel Operators enjoy similar results—

*More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.*

Texaco users enjoy many benefits that can also be yours. A Texaco Lubrication Engineer will gladly co-operate . . . just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

★ ★ ★

The Texas Company, 135 East 42nd Street, New York, N. Y.

## THEY PREFER TEXACO

- ★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.
- ★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.
- ★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.
- ★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.
- ★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.



## TEXACO Lubricants and Fuels

FOR ALL DIESEL ENGINES

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY ★ TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS

DIESEL PROGRESS, for January, 1943. Volume IX, Number 1. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized March 27, 1940. Subscription rates: \$5.00 per year, single copy, 50c.



# DIESEL *and* GAS ENGINE PROGRESS

**REX W. WADMAN**  
*Editor and Publisher*

FRONT COVER ILLUSTRATION: A Caterpillar Diesel Auto Patrol owned by the Hawaiian Contracting Company building a scenic drive and park at Waikiki Beach.

TABLE OF CONTENTS ILLUSTRATION: As a detachment of Canadian Commandos returned to British soil after the raid on Dieppe August 19, 1942, Caterpillar Diesel tractors aided in unloading armored vehicles. British Combine Photos, Ltd.

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**HEYWORTH CAMPBELL**  
*Art Director*



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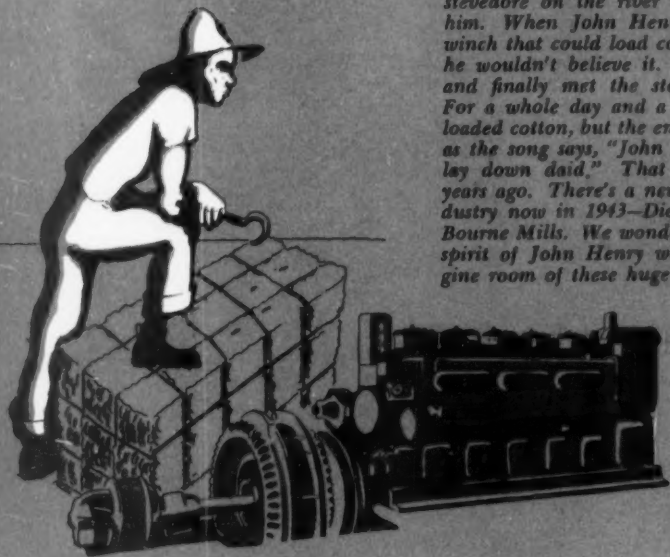
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# BOURNE *Mills*

OF NEW ENGLAND

By ART MICHEL

*Do you know the legend of John Henry? It is still told along the banks of the Mississippi and throughout the cotton-growing South. John Henry was the strongest man, who ever swung a bale of cotton on his back, along the levees where the river boats were loaded. He could work from dawn to midnight, loading cotton, and no other stevedore on the river or the Gulf could match him. When John Henry first heard of a steam winch that could load cotton faster than he could, he wouldn't believe it. He stormed and shouted and finally met the steam engine in challenge. For a whole day and a whole night John Henry loaded cotton, but the engine beat him down until, as the song says, "John Henry fell in a heap and lay down daid." That was all of one hundred years ago. There's a new power in the cotton industry now in 1943—Diesels, like these Diesels at Bourne Mills. We wonder what the big, unbroken spirit of John Henry would say, here in the engine room of these huge mills. . . .*

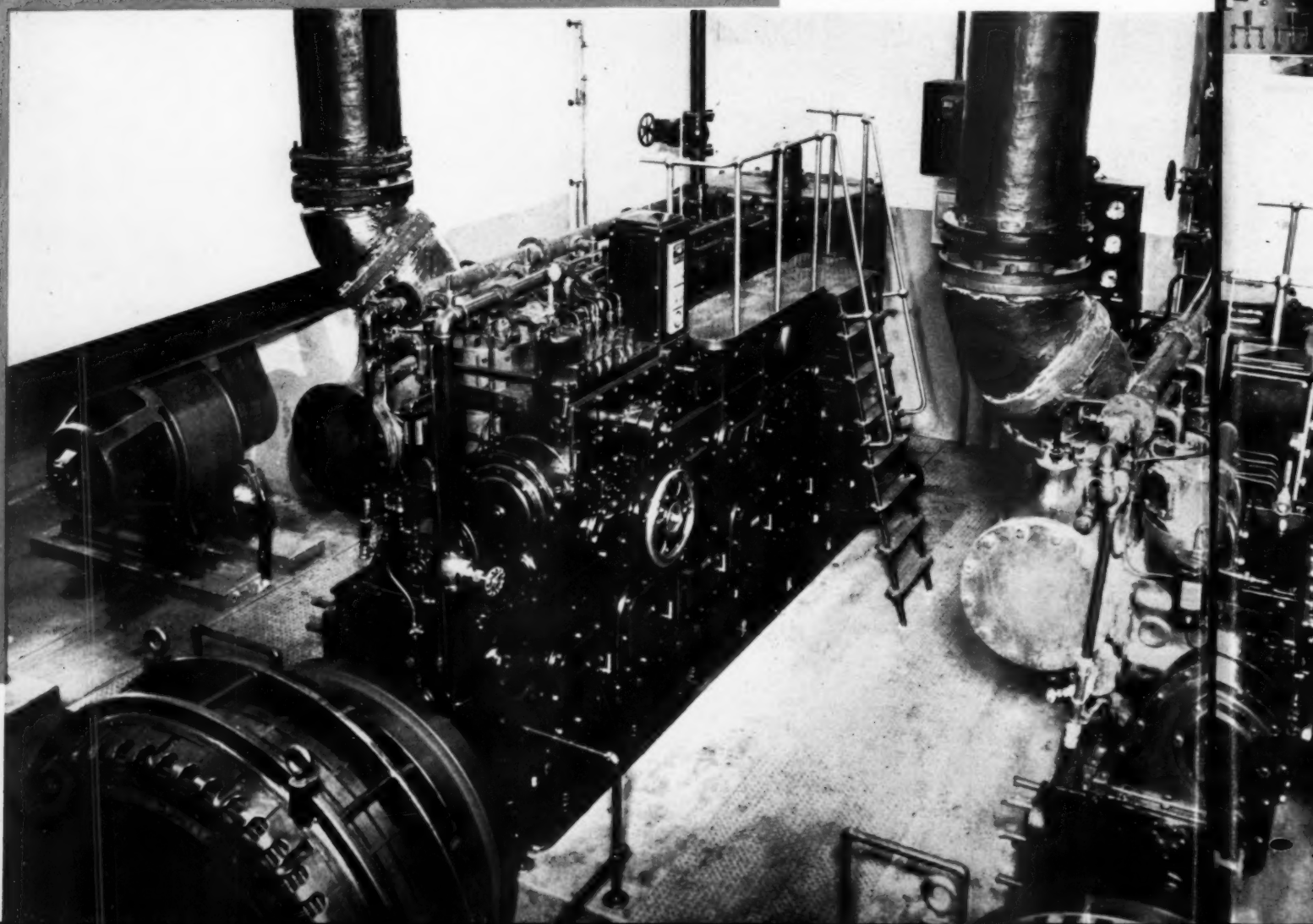


**T**HINK back to the days when you were a kid at school. Remember the maps you made in your geography class—maps of America, on which you would paste a small picture of a steer on Texas, a bit of oyster shell on Chesapeake Bay, a kernel of corn on Iowa? And then you'd have a square inch of cotton cloth from your mother's sewing basket, and you'd paste that right over the City of Fall River, Massachusetts. For that, your teacher told you, was a textile town, and though you'd never seen it, there was a good chance that you were wearing a shirt whose cloth was spun there.

Long before the Civil War, the Yankee dynasties had founded the capitals of their cotton empires in Lowell, Lawrence, and Fall River. They were truly empires, for the cloth from their mills found its way all over the world. It became the common dress of the Chinese coolie and the South Sea Islander; African missionaries won their way through the jungles with it. Cotton was a power in the world then, and the huge city-wide mills of Massachusetts stood behind it.

Such a mill is Bourne Mills, an orderly collection of block-long buildings to which generation after generation of Fall River people

*View looking down on the two F-M, 500 hp. Diesel generating units.*





have looked for their livelihoods. Its size? It's a mill of 90,000 spindles and, if that means little to you, just ask a textile man. In a year that means nearly enough cloth to band the Equator with a yard wide strip.

In earlier days this mill, as other great mills, was powered by steam. Long banks of hand-fired, coal-burning steam boilers made power to drive the spindles and the looms, the carding machines, and the myriad machinery that is so bewildering to the layman. And, early in 1941

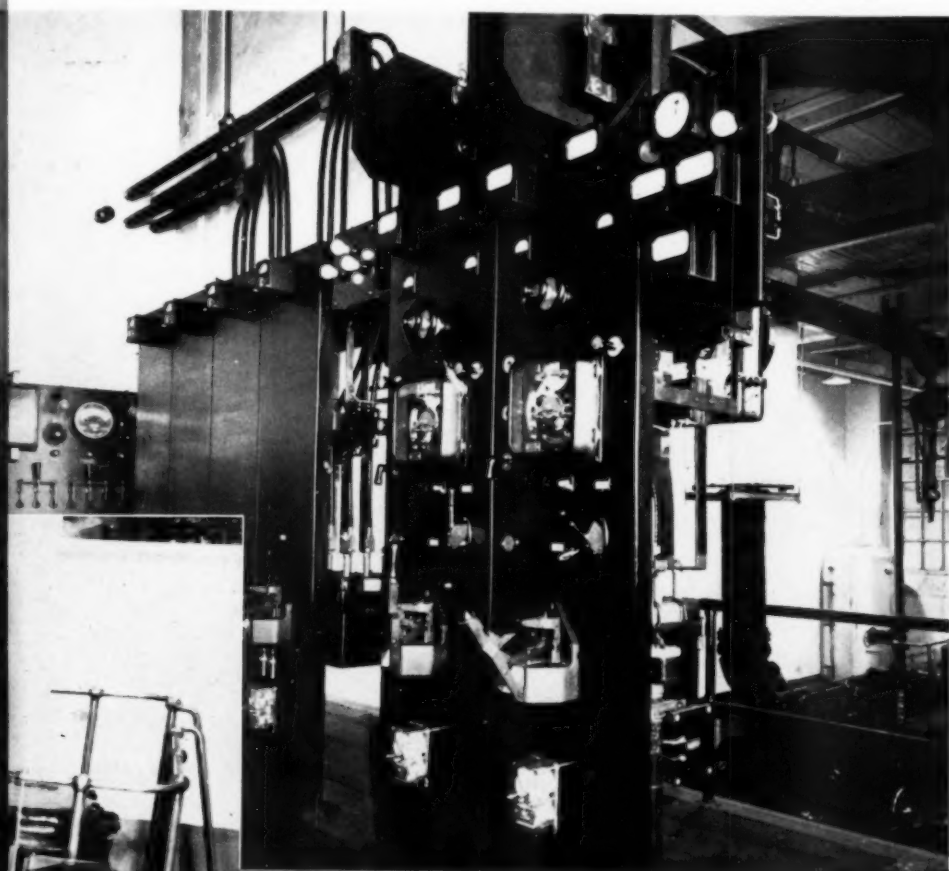
when the management of Bourne Mills decided to install Diesels, it was to supplement the steam plant of 2800 hp. that the decision was finally reached.

For some years, Bourne Mills had found it necessary to augment their steam power with electric power purchased from outside. By installing Diesels, they expected to save money in comparison with the outside rates . . . But they didn't expect that in six months of operation Diesels would also show 65% less operating

costs than the steam plant itself! And every one must have been equally gratified to learn that, by the record of the first six months, the two 500 hp. Diesels would pay for themselves in four years' time.

First of all, the mill is nearly always in full operation, which makes for a steady load of more than 90% of rated capacity on the Diesels. And, of course, when there is a slack, it's far more economical to let the Diesels continue with the brunt of the load, at which time they're operating at 100% of capacity.

*The Allis-Chalmers switchboard has Westinghouse instruments and A-C voltage regulators.*



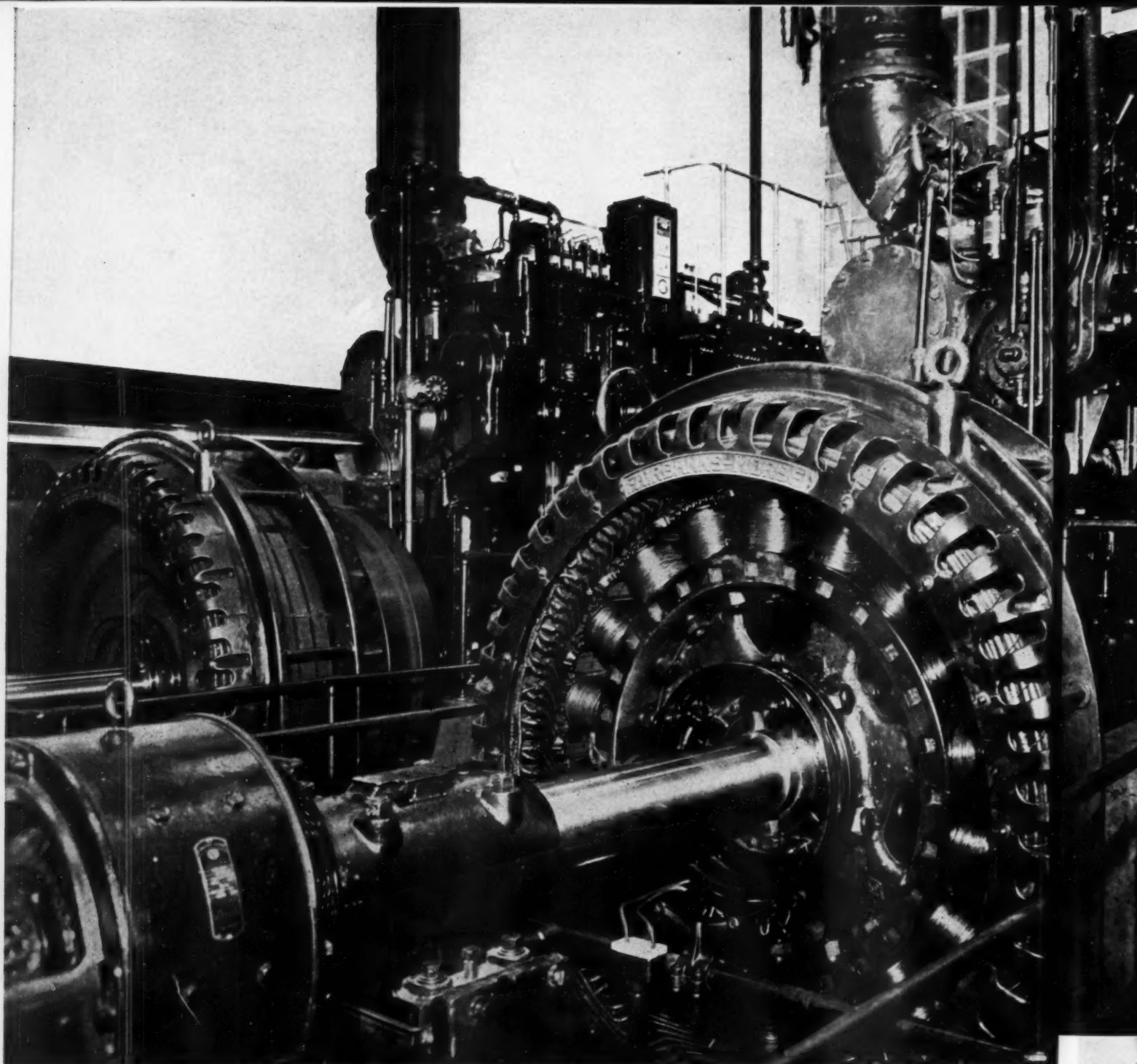
This steadiness of load conditions and the extreme care with which the Diesels are maintained, produced an operating record of .0056 cents for those first six months of operation, with every indication that this record will be continued in future months.

Let's have a look at this Diesel plant—the largest that we know of in any New England cotton mill. There are two 500 hp. Fairbanks-Morse engines, each a five cylinder unit operating at 400 rpm. Each engine drives a 342 kw. (at 80% power factor) Fairbanks-Morse alternator, with a direct connected 7.4 kw. exciter. The two Diesels are located in a sunken concrete emplacement, resembling the tidy, unencumbered engine room of a great ship which lies directly off the huge factory bay containing the steam plant.

Bourne Mills knew that from the start these engines would be delivering continuous power under heavy duty, and the officials determined that every last provision was made for any contingency that might occur. For instance, an alarm panel supplements the switchboard, and

*Partial view of the 90,000 spindle Bourne Mills.*





*In this view of the F-M Diesels are seen Woodward governors and Nugent fuel filters.*

when its pressure gauges indicate any mechanical threat to the engine, a horn sounds and a light flashes, signalling and indicating the trouble. A multipoint Alnor pyrometer is installed for checking individual cylinder performance on both engines.

But so far there's been no trouble. Lube oil is circulated under pressure to all engine bearings by built-in engine driven pumps, while a motor driven rotary pump serves as an auxiliary lube oil pump. Besides raising the oil pressure before an engine is started and cooling the system

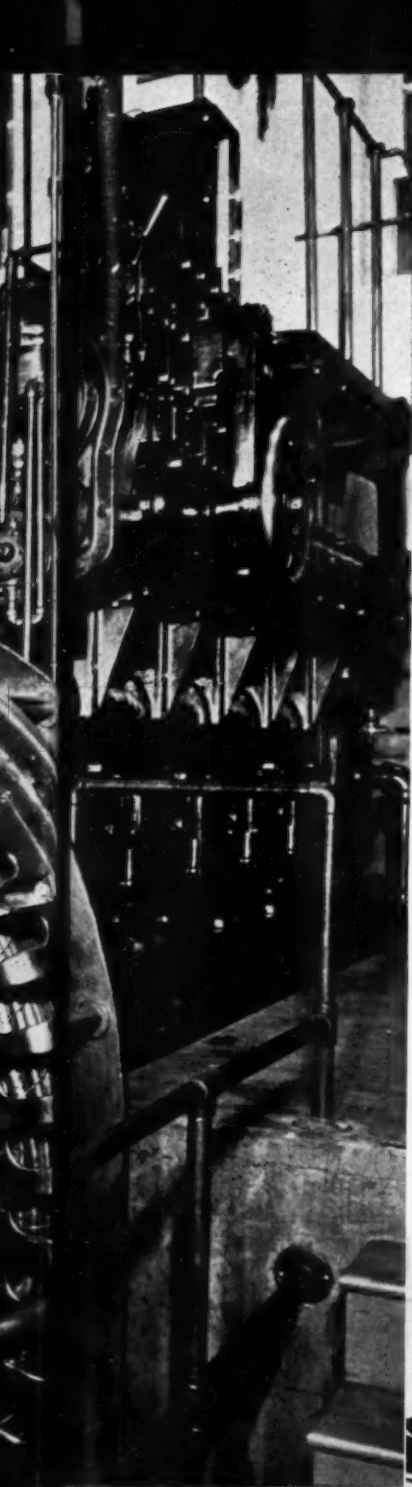
slowly after the engine is shut down, the auxiliary can be used just in case the main pump fails. A Youngstown-Miller purifier reclaims and purifies the lube oil after it drains from the engine. It's then stored in a 550 gallon tank until make-up is needed.

A closed cooling system eliminates any chance of scale formation in the water jackets, with the circulating water being pumped by 250 gpm. centrifugal pumps and 5 hp. motors. A similar pump draws raw water from a pond nearby to send it through the oil coolers, the heat ex-

changers, and back to the pond. Another pump just like it stands by for emergencies.

One of the finest, most sensibly arranged switchboards this author has seen looks out over the engine room. It is comprised of two generator panels, four feeder panels, and a swinging synchronizer panel. Kilowatt meters, ammeters, voltmeters, frequency meters, six totalizing kwh. meters, a pair of voltage regulators and oil circuit breakers also have their indispensable place on the board. Westinghouse made the switchboard instruments; Allis Chalmers the





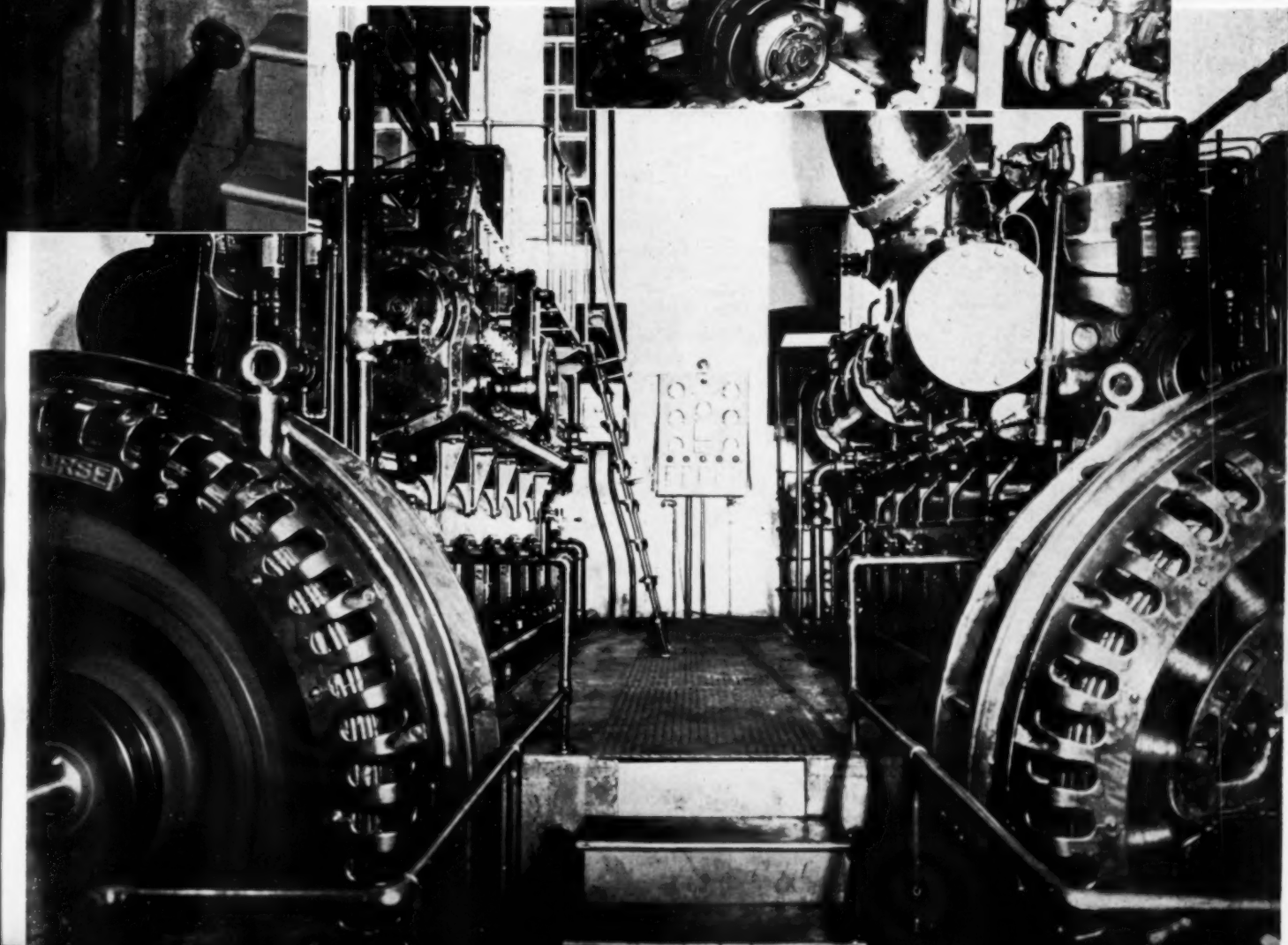
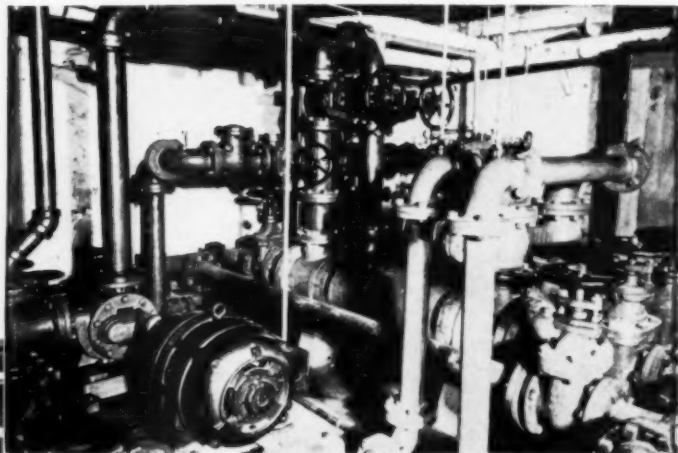
voltage regulators, and the board itself was fabricated by G & N Engineering Company. Either an electric motor or a gasoline engine drives the starting air compressor, and Maxim Silencers quiet the main engine exhausts.

Obviously, the physical properties of this fine plant account partly for the excellent operating record, but there's another and possibly greater factor. Bourne Mills, a relatively new user of Diesels, might have been expected to apply to its new power source the common sense and business sense that have made Bourne Mills a great name in textiles. Their operating record is not beginner's luck. Far from it. Indeed, this newcomer sets an example that might profitably be observed by a good many Diesel operators—and that's in the way it has formed its maintenance policy.

In the Bourne Mills engine room, injection nozzles are checked every 1500 hours, and once again you have this plant's similarity to that aboard a big ship. For Bourne Mills has instituted a rigidly maintained inspection routine, which aboard a ship may mean life and death, and which in a factory does mean production or non-production. This care is repaid by the constant availability of these power units.

Let's not make this story too long. All that's had to be said, has been said, and once again Diesels have taken on more of the industrial power load of America—this time in a division of the oldest "big" manufacturing industry in the country. In Bourne Mills, King Cotton—after the fashion of John Henry a century ago—has met the Queen of Power, and the records show a mighty profitable association.

*Right: Engine cooling is by closed system fitted with Ross heat exchangers and F-M circulating pumps, seen here. Below: Between the two Diesels is the gauge panel carrying Marshalltown gauges and Alnor pyrometer.*



**T**HE grand finale for American streamlined trains, as well as passenger equipment of the so-called "Luxury" class, bowed out in June when the Illinois Central Railroad, one of the pioneers in Diesel motive power for railroading, completed and quietly put its two magnificent twin Diesel trains, "Panama Limited," in service on a new daily overnight schedule between Chicago and New Orleans.

Such trains, together with a few more coach trains, will be the last for the duration of the war, unless the conservative Transportation Board suddenly realizes the value of new lightweight trains in displacing more seating capacity and in giving better and faster service.

The old formula continues—usually a new lightweight streamliner with Diesel locomotive replaces at least two steam locomotives and 50 percent of the old heavy equipment. In the case of the twin "Panama Limiteds," eighteen conventional cars and five steam locomotives are replaced for war use and increased local passenger movements, besides giving about 50% increased train capacity nightly between these two key cities.

Now a strategic war railroad, the Illinois Central links the Great Lakes with the Gulf on its fast mid-continent route lying east of the Mississippi. With the Gulf playing an increasingly vital part in movements overseas to South America, Panama, and Africa, besides Central America and the West Indies, the advent of a modern Diesel train is to be commended, in spite of the excessive timidity all railroads feel toward any class of equipment that could be called luxury. For the new service, the "Panama Limited" equipment consists of twenty lightweight Cor-Ten, electrically welded passenger cars and two baggage-dormitory cars, in addition to two identical 4,000 hp. Diesel electric locomotives. The cars will provide a regular nightly consist that can sleep up to 140 passengers, with setout cars in both directions for Gulfport, Mississippi, St. Louis, Missouri, and Cincinnati, Ohio, and leave two reserve Pullman sleepers for extra heavy travel.

The locomotives were built by General Motors at its La Grange plant, and are identical two-unit jobs, with operating cabs in either end to eliminate turning in terminals. These locomotives have all the usual safety devices and carry a large heating boiler in each unit to warm the train on the northern end of its run.

They have six-wheel trucks, with two geared, 600 volt traction motors to the outer pairs of

axles, and deliver a maximum tractive effort of approximately 99,000 lbs. at the drawbar, and have a total weight of 300 tons ready for the run. A fuel capacity of 2500 gallons and boiler water capacity of 2100 gallons is carried underneath the locomotive units. The Vapor Clarkson heating boilers mounted at the inner end of each unit will each deliver 2250 lbs. of steam per hour. The large fuel and water capacity make it necessary to make but a single stop between Chicago and New Orleans for replenishing liquid stores.

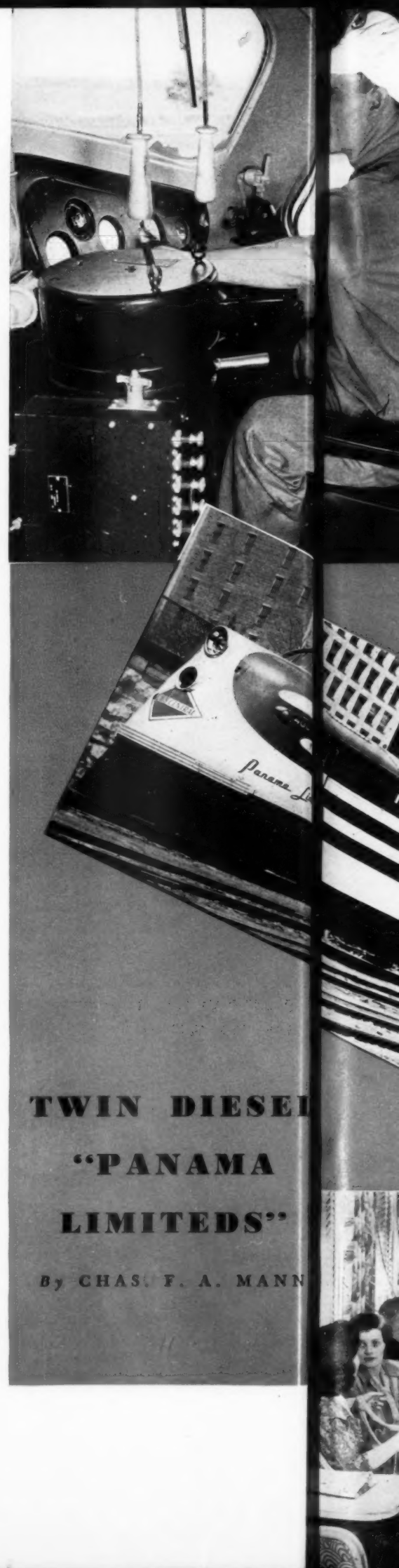
Roller bearing four-wheel trucks, specially designed for high speed and straight air, and an electropneumatic brake system are provided on the entire train, together with tight-lock couplers, double laminated glass sash, streamlined exterior of green and white and individual Waukesha propane gas air conditioning engines, which drive individual ice machines mounted under each car in an insulated, spring suspended sliding tray. A large 32 volt battery set, supplied by conventional Pullman axle generators, supplies current for the lighting and air conditioning motors.

All cars were built by the Pullman-Standard Car Co. of Chicago. Heating of the cars is accomplished by the floor side finned tube piping and warmed air circulating system overhead. The latest sponge rubber upholstery and a decorative scheme taken from the South of Evangeline's time; old New Orleans, right down to the delicate wrought iron work, and the Gulf Tropic motif in draperies and furnishing. The new "Panama Limiteds" are among the most beautiful trains ever built.

Fluorescent lighting is used in the lounge sections and dining room, and the whole train boasts of a complete automatic dial telephone system connected to each car.

The train is an entirely first-class passenger operation, offering, at no extra fare, every type of Pullman room and open section layout. Quarters for the dining car steward and the train stewardess are provided in rooms in the dormitory-baggage car. Individual radio sets, to eliminate the community radio clatter, are fitted in the observation, lounge and diners, and a public address paging system operates in all lounge and diner spaces.

The "Panama Limiteds" began their original mid-continent flights in 1916 and were named in a spirit of Pan American goodwill and unity. The new schedule cuts the 900-odd mile run to only eighteen hours.



## TWIN DIESEL "PANAMA LIMITEDS"

By CHAS. F. A. MANN





Top left: Engineer's compartment on the "Panama Limited," Diesel locomotive. Top right: One of four, 1000 hp. General Motors Diesels in each two-unit locomotive. Center: One of the "Panama Limiteds" leaving its Chicago terminal. Left: Solarium Observation Lounge.



**B**Y the man in the street, concerned chiefly with an intense desire to see Tokyo flattened and Schickelgruber hung from the highest limb, little is known of the planning, organizing and building required to implement world wide warfare. He knows, in the main, that we are getting results and that it takes a lot of materiel—as well as men to do the job.

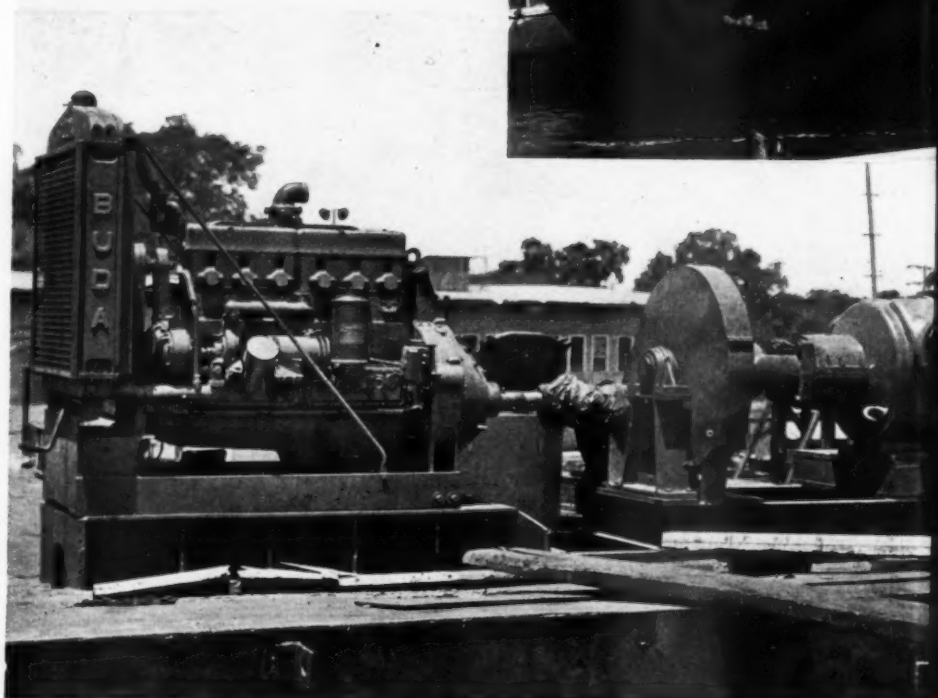
He does not consider the ways and means, the problems involved in moving and supplying a motorized and mechanized force. A huge air force is a glorious weapon but, without fuel, it isn't worth a hoot; our tanks by the thousands look well in the newsreels and will look even better when they're rumbling into Potsdam, but they must also have their fuel.

In fact, this is a very war of fuel. A fighting plane with a 2,000 hp. motor burns 200 gallons of gas in an hour of action and a four-motored bomber multiplies this figure. And when these figures are further multiplied by the thousands of planes which inevitably must be serviced, the realization comes home that fuel is the prime agent; fuel for the combatant force and millions of gallons more for the trucks that must haul this fuel to the front, to say nothing of the job of moving the monstrous mounds of ammunition, material, food, and other supplies.

Fuel for transportation also implies transportation for fuel. And when the Army wants transportation, it looks to the Transportation Corps to which is entrusted the Army's transportation in all its aspects. The Transportation Corps lacks the glamour of the pilots and the bombardiers—they are rare features in the headlines or the newsreels—but in the job of winning this war, the Transportation Corps is a vital, indispensable unit.

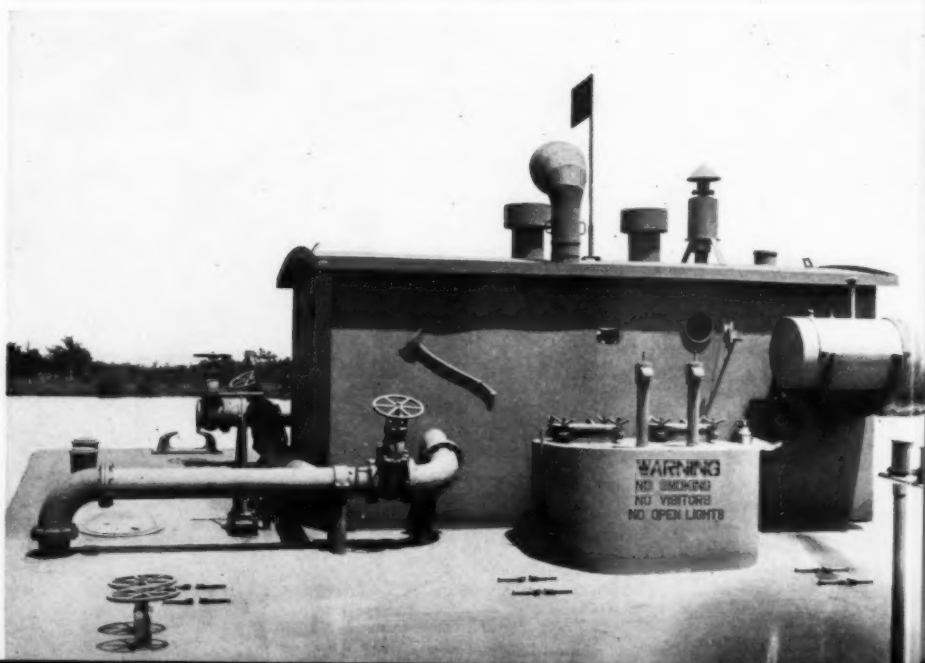
These transportation masters have not been asleep. Many, many months before Pearl Harbor, the Transportation Corps was steadily and swiftly constructing and assembling transportation equipment for the big job that would have to be done sooner or later. Water trans-

*Typical U. S. Army fuel barge with deckhouse enclosing a Diesel cargo pumping plant.*



*This compact Diesel pumping unit is installed in its deckhouse which is then lowered to the barge deck and welded in place.*

*Closeup of the deckhouse showing cargo piping arrangement, Diesel fuel tank, and Maxim spark arrester silencer.*



FUEL

POH

BAR

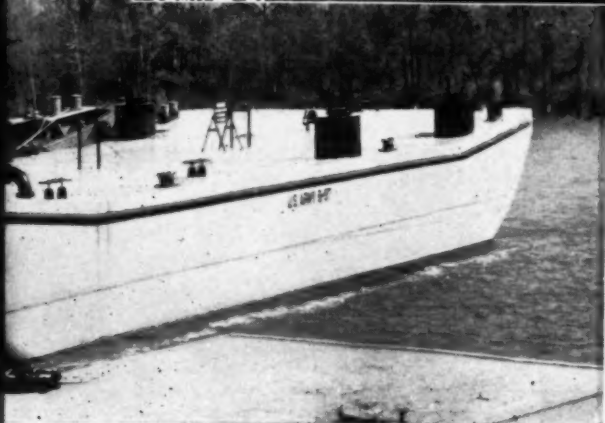
By W A

Interes  
Barges  
C





*Above and left: Two more fuel barges built by Equitable Equipment Co., all equipped with Buda-Lanova Diesel pumping engines.*



portation as well as land equipment received attention; as to the actual number of hulls of all types, the Transportation Corps is runner up to the Navy.

Besides its enviable fleet of troop ships, refrigerator ships, ammunition ships, tankers, tugs, cargo vessels and other self-propelled bottoms, the Transportation Corps uses many barges and is just as particular about its barge specifications and construction as it is about its other craft. The new all-steel barges for the Army's use, especially these for the transportation of petroleum products, are the very best that can be built.

On the assumption that shipbuilding firms which had been most successful in tank barge construction for the major oil companies and similar users of heavy barge equipment would be equally efficient in fabricating bottoms for Army use, initial contracts for ultra-modern arc-welded steel barges went to selected bidders.

Design of these barges, adequately bulkheaded and trussed, corresponded to the type most satisfactory for bulk transportation of petroleum products. The length, beam and capacity which had been proven by years of operation by civilian users to be most practical were accepted as likewise best adapted for moving Army fuel. After delivery of the initial barges, months of service in widely separated localities and under materially divergent conditions

proved both design and construction to be sound. Excellence of workmanship and prompt contract performance on the first barge contract brought further barge orders. This year, beside the numerous tugs delivered to the Transportation Corps, a steady procession of barges, identical to those accepted last year, has passed the B.M.I.N. inspection and has been delivered.

As speed in taking on or discharging the cargo of vitally important fuel is a "must" on the Army list, each barge is equipped with a rotary pump of sufficient diameter to obviate any unnecessary delays in action.

For positive performance, this cargo pump is direct connected to a Diesel engine of the modern high performance type. As no propulsion enters into the picture, the barges being of the towed variety only, without living quarters and classed as unmanned, a Diesel of the full-fledged marine style is not necessary. Stationary engines, equipped with straight factory equipment as supplied by many prominent Diesel manufacturers to the specifications of industrial users, have been found quite satisfactory. The results obtained from the Diesels powering the pumps in the initial barges assured repeat Diesel specifications for the numerous additional barge contracts executed this year for the Transportation Corps.

Careful thought has been devoted to the installations of pumps and power plants, with the purpose of furthering safe and dependable performance. Separate compartments are provided for pumps and Diesels, with ample ventilation supplied. As fire hazard is always unavoidably present in connection with handling highly volatile fuels, this angle has received particular study. The selection of Diesel, with its absence of high-voltage ignition and possible spark-gaps with attendant explosive potentialities, is in the first instance a sound preventive of gasoline fires. Another precaution is in the selection of silencers of the spark-arrester type for the Diesels. Live sparks from ordinary mufflers have no place on a gasoline barge.

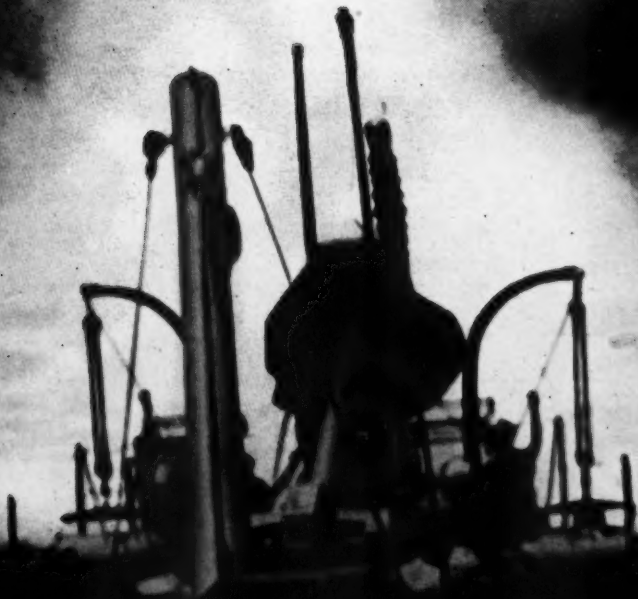
A barge is only a barge, and the story of such a craft and its power plant must obviously be simple. Nevertheless, these modern Army fuel barges have received as meticulous attention in design, specifications and workmanship as is accorded to sea-going tugs or other vessels intended for constant service far from a base of repair or supply. Construction has been conducted under the immediate supervision of officers of the Transportation Corps.

## FUEL TRANS- PORTATION BARGES

By WARREN GLEASON

### Interesting New Gasoline Barges with Diesel-driven Cargo Pumps

**ASH CANS—SPECIAL DELIVERY**





**H**ere's prompt, reliable delivery of Yankee ash cans to enemy submarines.

In the engine room of this swift, peppery little ship, you'll find familiar friends—a pair of untiring, responsive, long-serving GM Diesels.

Yes, the engines that are powering hundreds of Uncle Sam's Army and Navy vessels—that are driving countless hard-working commercial boats—are also on the job in Navy sub chasers.

**CLEVELAND DIESEL ENGINE DIVISION, General Motors Corporation**

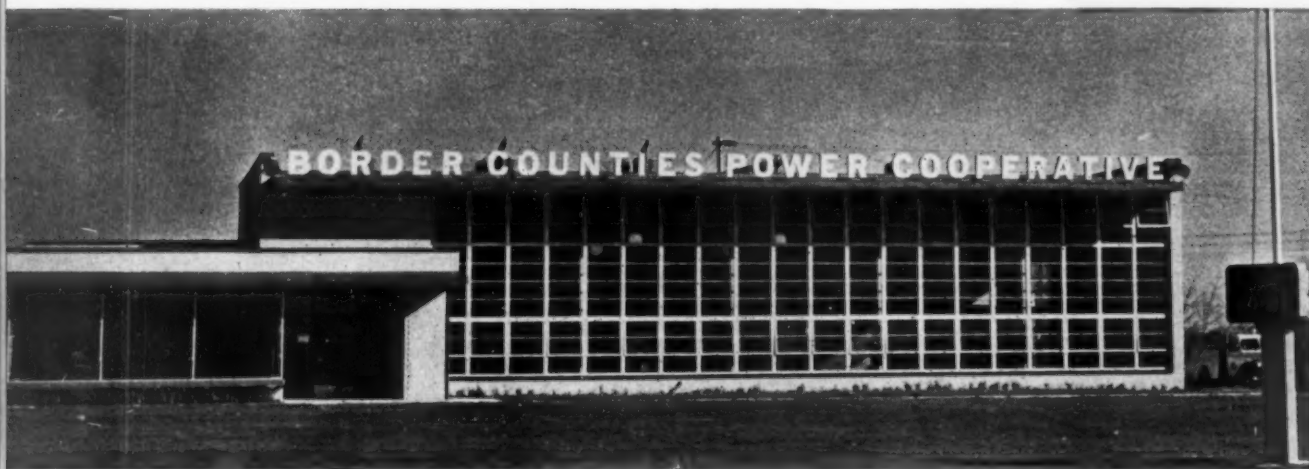
**GENERAL MOTORS  
DIESEL**



U. S. NAVY PHOTOS

# BORDER COUNTIES POWER COOPERATIVE, INCORPORATED

By GEORGE D. CROSSLEY



*This modern R.E.A. power plant serves the isolated farm homes along the Canadian border in Northern Minnesota.*

**A**LONG the Canadian Border in northern Minnesota is a strip of good farming land known as the "Border Country." This area is inhabited by up-and-coming aggressive people and to them, as in many other rural districts, Rural Electrification was an ambition and a most desired necessity. Following the usual procedure of the times, the farmers in each of the three counties involved; namely, Roseau, Lake-of-the-Woods, and Koochiching, organized their respective distribution cooperatives and set out to secure electric energy for their farms.

The region is more or less isolated and is not served by any public utility. A number of small towns in the area had municipal power plants, but none had surplus capacity sufficient to meet the demands of the rural lines. So, the three distribution cooperatives formed a fourth cooperative, the function of which was to furnish the three distribution cooperatives with electrical energy. This cooperative is known as the

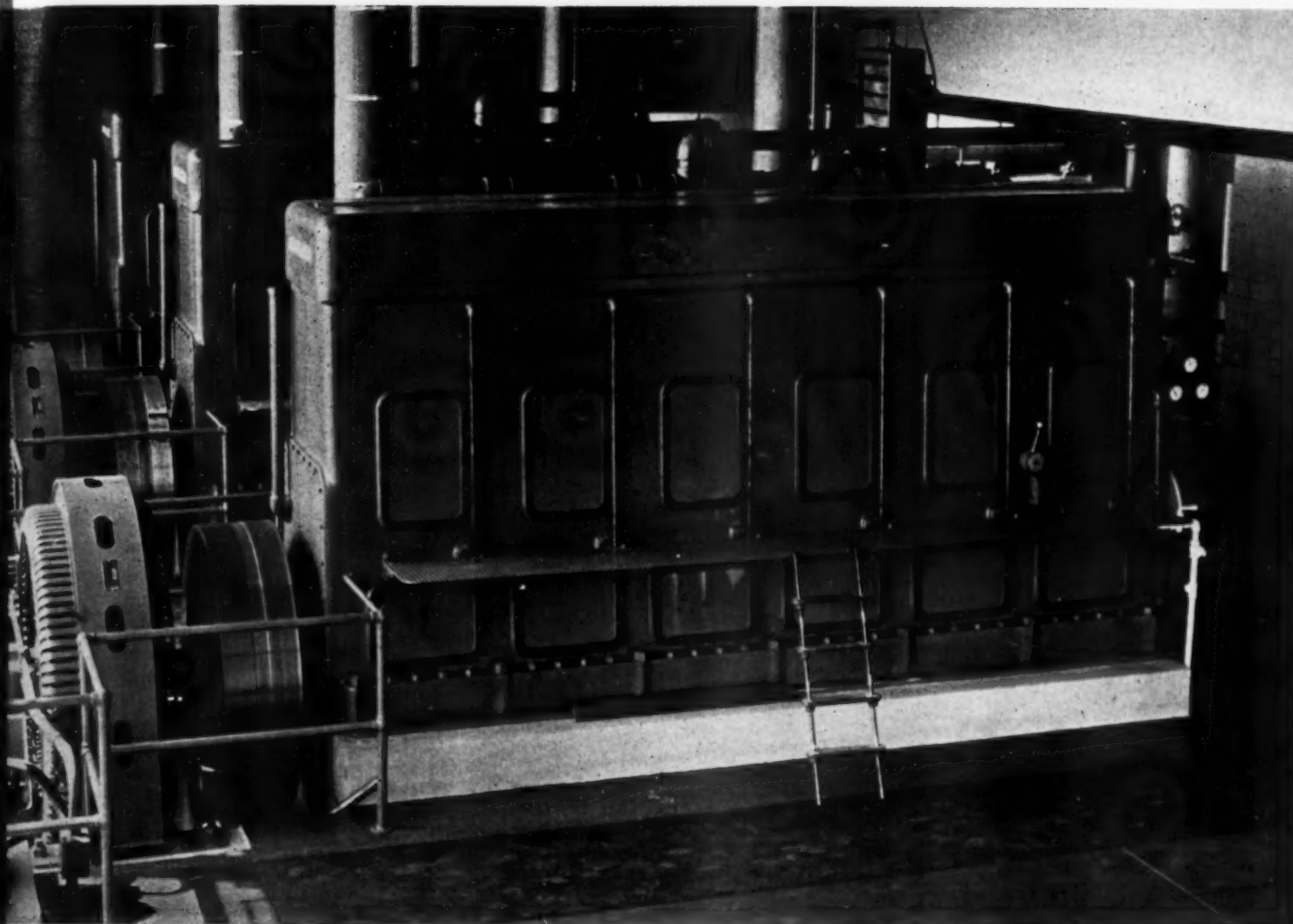
"Border Counties Power Cooperative, Incorporated." An application to the Rural Electrification Administration for funds to provide the necessary generating facilities was made in the spring of 1941 and the funds were immediately made available.

A study of the territory and the problems involved showed that the area could be satisfactorily served from two plants—one located at Warroad, Minnesota, and the second at Little Fork, Minnesota, distributing and transmitting a standard R.E.A. line voltage of 7.2/12/5 kv, interconnected by a three phase line, approximately 110 line miles in length. This line forms the backbone of the distribution system. The Warroad plant was designed as the main unit with the Little Fork plant to serve as a booster plant during peak loads or as conditions required. The main plant at Warroad is now completed and in operation, but the construction of the Little Fork plant has been postponed for the duration of the War.

The Warroad plant is located one-half mile east of the town on a ten acre tract of ground lying between State Highway No. 11 and the Canadian National Railroad tracks. This new plant, which went into operation on July 24, 1942, is designed to house three 504 hp., 400 rpm. Buckeye Diesels, with space provided for additional units when needed. The three 504 hp. Buckeyes have been installed and are now in operation.

The engines are direct connected to three 354 kw, 1.00 P.F. Electric Machinery 2400 volt generators. Each generator is excited by means of a 7½ kw. Electric Machinery exciter which is V-belt driven from the end of the main generator drive shaft. The engines are equipped with Woodward Type VG-8 oil governors. A gauge board on each engine is equipped with lube oil pressure, water pressure, and starting air pressure gauges. Thermometers are provided on the lube oil inlet and outlet of each





*The three Buckeye, 504 hp. Diesels and E.M. generators in the Warroad, Minnesota, plant.*

engine, cooling water inlet of each engine, and cooling water outlet of each cylinder.

The generating units are installed on solid concrete foundations measuring 25 ft. long, 8 ft. 6 in. wide, and 11 ft. deep. Each foundation is completely isolated from the rest of the structure to prevent transmission of vibration from the engines to the structure.

The air intake for each engine is located on the roof of the generating room. The incoming air is passed through an Air-Maze oil bath filter and is brought through a 12 in. pipe to each engine. The exhaust from each engine is taken through the floor to Maxim combination waste heat boilers and silencers, which are mounted horizontally in the basement and are located between the engine foundations. Tail pipes from the silencers run straight up through the roof of the generator room. The Maxim waste heat silencers are used as hot water boilers and

are interconnected to an oil-fired Crane boiler and this combined system is used to heat the entire building. The oil-fired boiler is controlled thermostatically and goes into operation when the heating load of the building exceeds the output of the waste heat boilers. It is estimated that the exhaust of one engine at full load will supply enough heat to warm the entire building, with the outside temperature at 40° below zero, a condition which is not at all rare in this part of the country.

Fifty thousand gallons of fuel oil storage is provided by means of two 25,000 gallon above-ground Adamson tanks. Provisions for receiving incoming fuel oil include a railroad spur built by the Canadian National Railway Company equipped with a tank car unloading rack and a truck unloading station. The fuel oil is transferred from either tank cars or trucks to the storage tanks by means of two Roper rotary gear pumps powered by 1½ hp. Master motors.

During the winter months, hot water from the plant heating system is circulated through heating coils in the storage tanks by means of a Weinman single stage centrifugal pump powered by a Master 3 hp. motor. A 280 gallon fuel oil day tank is provided for each engine and is located in the basement at the end of the engine foundation. Fuel oil is transferred from the storage tanks to the day tanks by either gravity flow or by use of the fuel transfer pumps previously described. The fuel pump on each engine takes the fuel from the day tank and passes it through a Briggs fuel oil clarifier and to a small fuel oil sump located in the engine. Any overflow of fuel oil is passed back to the day tanks. The fuel oil for each engine is metered individually by means of 1¼ in. Niagara meters. A 2 in. Niagara meter is provided to measure the fuel oil as it is unloaded from tank cars or trucks.

Levelometers are provided for the fuel storage tanks and for the day tanks and are mounted

on a gauge board located alongside the fuel transfer pumps. High and low fuel level alarms are provided for the day tanks.

Lubricating oil for each engine is stored in a 50 gallon sump located in a pit provided in each engine foundation. A Honan-Crane continuous type refiner is provided for each engine and is located in the basement at the end of the engine foundation. A 500 gallon lube oil storage tank is located in the basement. Lube oil is added to the sumps from the storage tanks by means of two Roper rotary gear transfer pumps powered by 1/3 hp. Lima motors. Lube oil is cooled with Ross oil coolers.

The engine cooling system is a typical closed system. Each engine is provided with a Buffalo Forge evaporative cooler. Circulating water is pumped by means of single stage Weinman centrifugal pumps driven by 5 hp. Master motors. The dampers of the evaporative coolers are controlled by Minneapolis-Honeywell modulator motors, which are in turn controlled by Minneapolis-Honeywell aquastats located in cooling water lines from each engine. The entire cooling system is interconnected through headers so that any evaporative cooler and pump combination may be used with any one of the engines.

Water used in the plant is obtained from two 6 in. wells, 125 ft. deep located at opposite ends of the auxiliary equipment room. Each well is capable of producing 75 gpm. and is equipped with a Peerless Hi-Lift pump. The pumps may be operated individually or together. Water is pumped from the wells into a 1000 gallon pressure-storage tank. Pressure is maintained between the limits of 25 and 45 at all times by means of a Detroit lubricator pressure switch, which automatically controls the deep well pumps. Before the water is used in the plant, it passes through a Permutit water softening system. Two sets of softeners are installed so that one is always in service while the other is being generated. All water used in the plant, with the exception of the outside hydrants, is softened. Engine starting equipment

consists of two 20 in. x 60 in. air tanks, a Lima motor driven Curtis compressor, and a Wisconsin gas engine driven Curtis compressor for emergency standby service.

The electrical output of the plant is controlled and measured by a twelve panel switchboard which was built and installed by the L. A. Kepp Contracting Company of Rochester, Minnesota. The switchboard is 24 ft. long and 7 ft. 6 in. high and is located in a 12 in. x 30 in. switchboard bay at the working end of the engines.

The board is equipped with a Westinghouse indicating meters, watt-hour meter, total hour meters, switches and electrically operated oil circuit breakers. An Esterline-Angus combination recording voltmeter and wattmeter provides a graphic record of the voltage and output of the two feeder circuits from the plant. Westinghouse silvertstat voltage regulators are provided for each generator. An Allis-Chalmers synchro-operator provides for completely automatic synchronizing. All the auxiliaries in the plant are controlled from an auxiliary equipment control panel on the switchboard. Pilot lights show which equipment is in operation.

High and low level fuel oil alarms and the engine alarm system are connected to an Edwards annunciator, which sounds a warning horn and also indicates which alarm is sounding. The engines are protected by highwater and lube oil temperature, and low water and lube oil pressure alarms. Alnor pyrometers for measuring exhaust temperatures are located on the auxiliary equipment control panel.

A 24 cell bank of Grant storage batteries provides 48 volt DC current for the operation of the station emergency lighting system, oil circuit breakers, synchro-operator and the governor control motors. The station substation is located in the basement and consists of two 15 kva. and one 25 kva. Westinghouse Inerteen filled transformers.

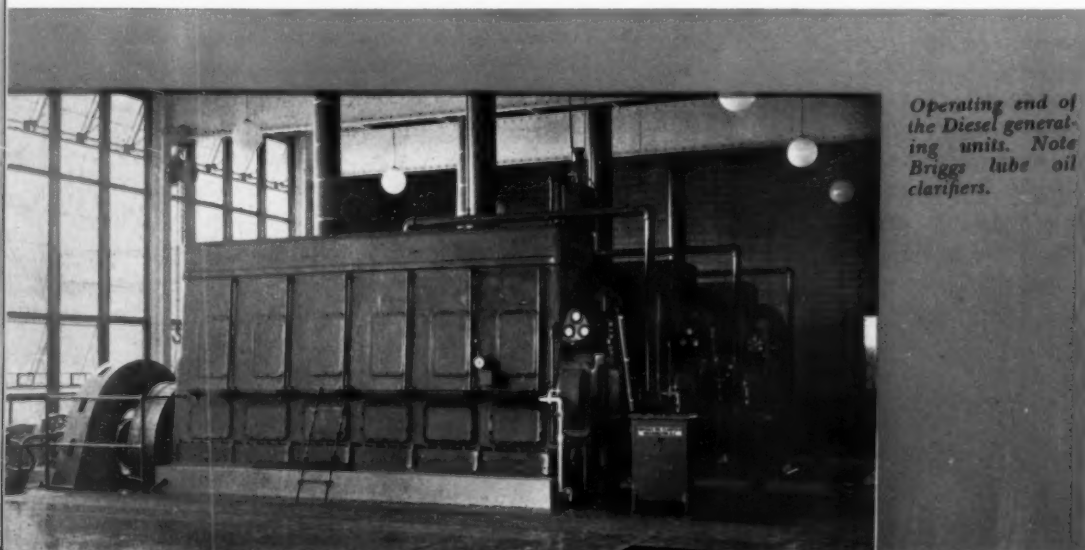
The distribution substation is located just to the north of the building. Due to the National

Emergency, which made impossible the delivery of materials and equipment for the construction of the substation as originally designed and planned, a temporary wood pole structure was built, and used equipment obtained from other R.E.A. cooperatives was installed. Four 100 kva. Wagner 2.4 kv.-7.2/12/5 kv. V O H transformers are now installed in this territory substation.

The building follows strictly a modern trend in architectural design. It faces southwest and the entire front elevation is of glass. Projecting canopies over these large glass windows were designed to eliminate the rays of the summer sun, yet permit the entrance of the rays of the winter sun. All wall areas in the engine room, workrooms, and auxiliary equipment rooms are of glazed tile. Provided in the building, in addition to space for the generating equipment, are a large general office and display space, office for manager and his staff, a chief engineer's office, restrooms, and shower and locker room facilities for the operating staff. A large triple glazed, rubber mounted, plate glass window permits visitors to view the engine room from the general office, yet effectively eliminates the passage of engine room sounds to the general office. A similar window is provided in the chief engineer's office.

Particular attention was paid to the lighting of the structure. The entire office wing is provided with fluorescent lighting. A specially designed concealed fluorescent fixture 26 ft. long lights the entire switchboard. This fixture was designed to distribute light equally over the entire face of the board and to prevent any glare from the various meters and instruments. Incandescent lighting was used in the engine room and auxiliary rooms, rather than fluorescent, due to the fact that with fluorescent lighting any sudden voltage drop that might occur due to a fault on the distribution system would tend to throw these important areas into darkness. All fixtures are equipped with daylight bulbs and tubes. Floodlighting is provided for the entire area surrounding the structure. The plant presents a very impressive picture at night.

The layout design and engineering work was done by the General Engineering Corporation of Minneapolis. The project was financed entirely by Government funds lent through the Rural Electrification Administration, whose engineers and architects cooperated with the consulting engineers in the design, purchase of equipment and construction of this ultra-modern, though isolated plant.



Operating end of the Diesel generating units. Note Briggs lube oil clarifiers.

This turbine and turbine combine the advantages of how the out of the casing

View of the turbine and turbine combine the advantages of how the out of the casing

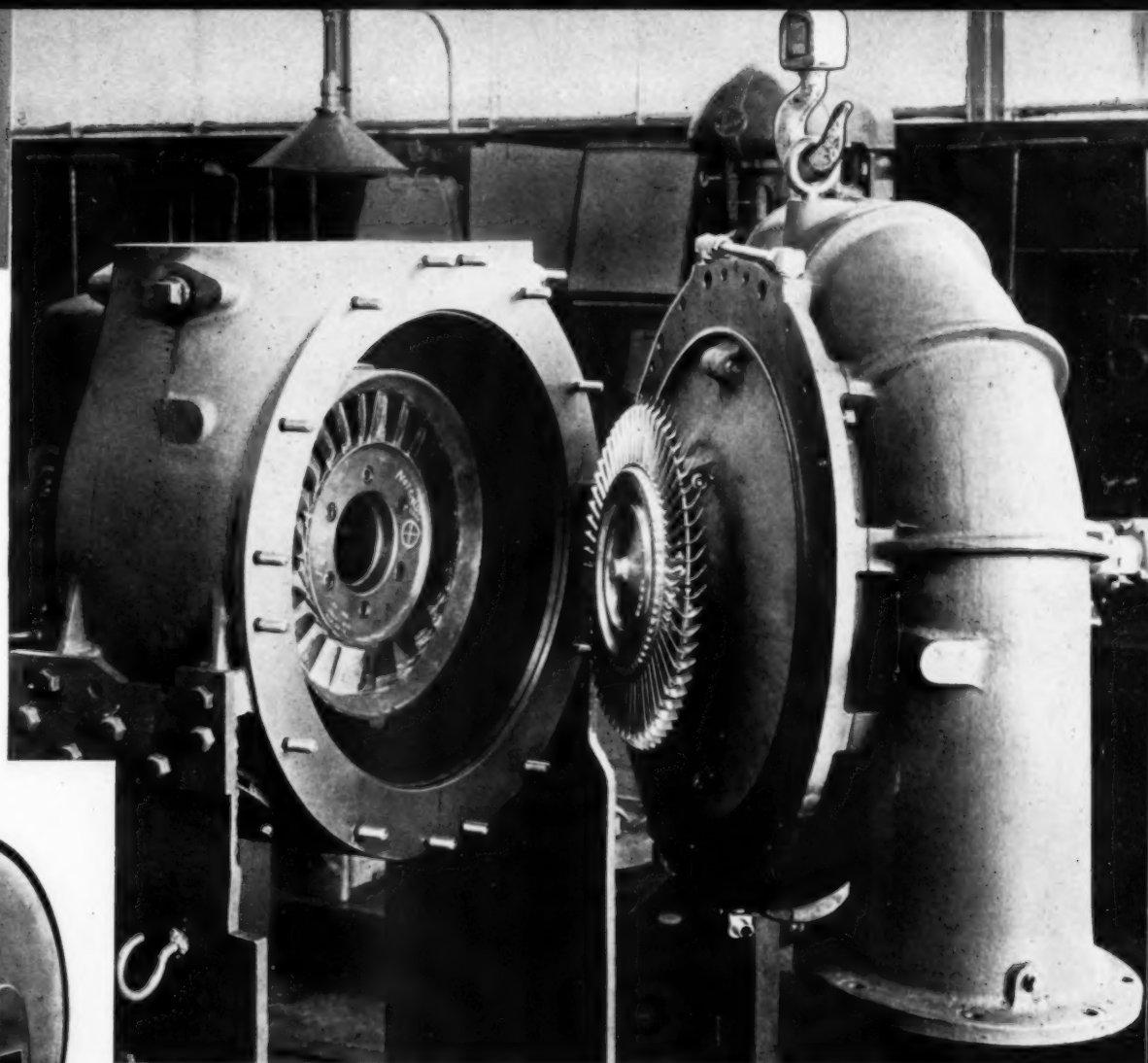


WHEN announced manufacture with the B cycle Diesel build and sizes in which war clouds time for America's scores of Diesels to While engineering preliminary design, the fill rush on



This assembly view shows the turbine casing with nozzle rings and the blower casing with turbine wheel in place, illustrating the accessibility of the unit and how it may be dismantled without breaking hot exhaust connections to and from the turbine casing.

View of the latest design of Elliott-Buchi turbocharger for supercharging four-cycle Diesel engines.



## ELLIOTT-BUCHI

### TURBOCHARGER IMPROVED

**W**HEN early in 1940, Elliott Company announced that it had acquired the rights to manufacture exhaust gas turbochargers for use with the Buchi System of supercharging four-cycle Diesel engines, it was the intention to build and test thoroughly each of the various sizes in which the units were to be made. But war clouds were darkening. Before there was time for an adequate testing and trial period, America's Defense Program was calling for scores of turbochargers for use on four-cycle Diesels to be installed in all sorts of vessels. While engineers were working the expected preliminary "bugs" out of the turbocharger design, the shop had to be producing units to fill rush orders.

The redesigned turbocharger, which is now in production, is shown in the accompanying photographs. Extensive tests and experiments were conducted on various types and styles of internal construction. Much attention was given to the matter of quieter operation, since a large number of turbochargers were being installed in the holds of ships, where the high-pitched noise of a high-speed machine might be objectionable to engine room operators. The present design gives very gratifying results under noise level tests on production units. The redesigned unit has been simplified and made more accessible to facilitate inspection and maintenance on board ship. This has been accomplished by eliminating the necessity for

breaking the engine exhausts leading to the turbocharger and the turbine exhaust discharge from the turbocharger. It is now necessary only to remove the blower casing and rotating element in order to have free access to the internal parts of the new Elliott-Buchi turbocharger. So to interfere as little as possible with the war effort, it was decided to use the same rotating parts in the new design as the old, thereby eliminating the necessity of an excessive number of spare parts and material to be carried on hand for maintenance jobs. The new unit was also designed to fit into practically the same space and to have, as nearly as possible, the same inlet and outlet connections as the previous design of turbochargers.

# WATER RHEOSTAT FOR TESTING DIESEL ENGINES

By C. C. WHITTAKER \*

A SIMPLE, "home-made" rheostat can be built that greatly facilitates the testing of Diesel-powered engines. Such a rheostat is inexpensive to build, and yet affords maintenance men the opportunity of conveniently and accurately testing new or overhauled engines under various loads. It can be made almost entirely of parts available in any shop.

Most liquid rheostats have used various salts dissolved in water to form electrolytes, such as sodium chloride, (NaCl) and sodium carbonate ( $\text{Na}_2\text{CO}_3$ ), the latter giving the more satisfactory results because of less corrosion on the steel parts wet with the electrolyte. Because this electrolyte gets hot, it is frequently necessary to add cold water and more salt to bring the temperature and conductivity of the electrolyte within operating limits. This procedure is inconvenient and causes loss of time.

The rheostat described here does not need salt

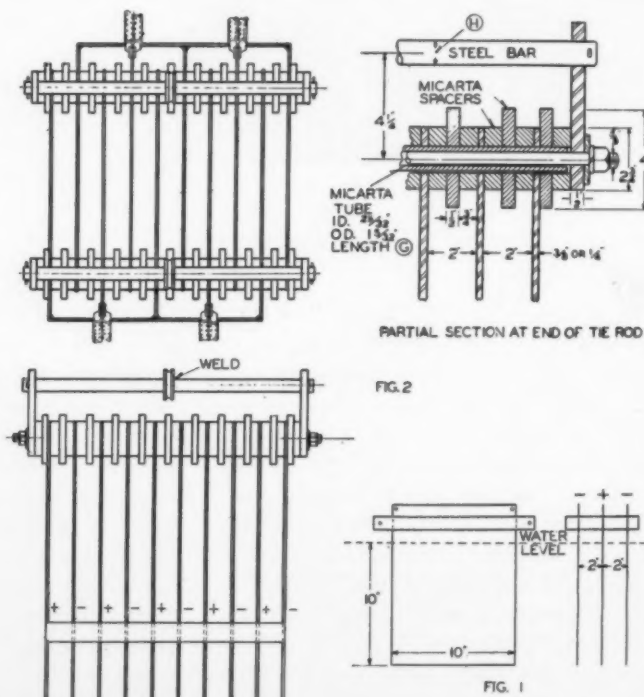
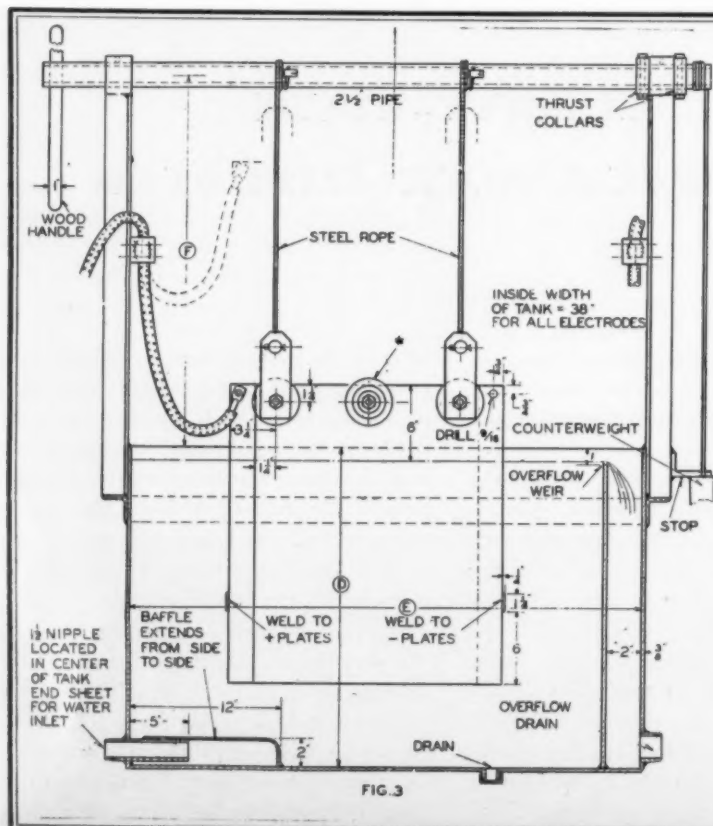
\* Transportation Engineering Department, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pennsylvania.

of any kind, but employs tap water just as it comes from the water system. Water is permitted to flow through the rheostat continuously while the test is in progress, the amount of water being varied to suit the load. Approximately 34 gallons of water per minute will carry off the heat generated by the output of 1,000 engine horsepower, assuming 93 per cent generator efficiency and 5 per cent loss for auxiliaries. The specific resistance of tap water differs considerably in different localities. This can be compensated for, in a large measure, by making the rheostat of such a size that it will match the resistance of water.

The first step in building a rheostat should, therefore, be to determine the specific resistance of the water that will be used. This can be done by means of three pieces of flat sheet iron 10 in. wide, 12 in. long and of any convenient thickness. All oil and grease should be removed from the plates with soap and hot water before assembly. The sheets are then spaced 2 in. apart by wood strips and clamped together by two bolts, as shown in Fig. 1. This

test rig, when immersed in water so that 10 in. of the plates are below water level, will then have 100 sq. in. on each side of the positive plate, each square inch acting through 2 in. of path to a negative plate. A wood box or a steel tank may be used providing the plates are 5 in. or more away from the tank.

The resistance of the water is determined by applying 500 to 600 volts d-c to the electrode and measuring both voltage and current. The locomotive generator may be used for this purpose if no other source is available. The resistance of the water will be  $R = E/I$ . Since there are 200 sq. in. of area, each with a 2 in. length of path, one cubic inch of water will have a resistance of  $200 R/2$ . Readings during the above test should be taken with the sample water at approximately 30-degrees C., since the resistance decreases as the temperature rises, 90-degrees C. water having approximately half the resistance of water at 30-degrees C. While the readings are being taken, the water should be agitated by a wood paddle or by having water





flow past the electrodes to minimize the effect of polarization. Having determined the resistance of a cubic inch of local water, reference should now be had to the table which gives required dimensions of rheostats, built as shown in Figures 2 and 3.

Obviously, a rheostat could be designed with such large plate area and low current density that the plates would last indefinitely. The first cost, however, and size of such a device would be prohibitive, especially for the railroad which requires only an occasional test of this kind. Accordingly, the dimensions of the design have been reduced to permit low first cost and sufficient life for railroad application.

Wherever direct current is passed through a liquid rheostat, the positive electrode is chemically decomposed over a period of time, the rate increasing with the current density of the electrodes. In the design given for the 1000 hp. rheostat, the estimated life of the electrode required by 800-ohm water is 200 hours at maximum rating. If the water resistance is greater than 800-ohms per cubic inch, the life of the corresponding electrodes will be longer because of the decreased current density, the life varying in direct proportion to the electrode area for the same electrode thickness. A great deal of the testing will be done at less than full load rating so that the actual time of disintegrating should be much longer than this. Frequent

reversal of plate polarity should be made to wear out both electrodes uniformly. The electrodes can be made of ordinary boiler plate steel worked to proper shape and size.

The Micarta insulating spacers before being assembled should be dipped in Alkyd resin varnish, and allowed to become dry enough to handle. When assembled in this condition, and the tie rod nuts drawn up tightly, the plastic varnish coat will yield enough to make well sealed-off joints between all adjacent surfaces. After the assembly is complete, all insulating washers should be given two coats of this varnish.

At full load, the electrodes must carry approximately 1100 amperes for 1000 hp. output and approximately 1650 amperes for 1500 hp. output. The cables must be sufficiently flexible to permit movement of the electrodes. It is, therefore, desirable to divide this current between four cables for each polarity, using 600-volt cable having 259 strands of 0.0253 in. diameter wire, the cable having a bare diameter of 0.533 in. and an overall diameter of 0.841 in. for the 1000 hp. design. The four cables are held in split wood cleats as shown in Figure 3. For the 1500 hp. design, use four cables each of 50 per cent larger cross section than the above described cables.

Adjustment of the height of the electrodes in

the water can readily be made by hand by turning the supporting pipe by means of the wood handle. With the electrode counterweighted, there should be enough friction in the bearings to hold any given adjustment. If remote control is desired, it is a simple matter to attach a motor and gear reduction unit to the shaft. In order to make the test set safe for operators, the tank should be grounded. This can most easily be done through the water inlet pipe.

In localities where the water is so pure that the resistance is too high to be used without excessive plate areas, the largest design shown can be used and the low conductivity of the water supplemented by the addition of sodium carbonate as found necessary. If this is done, the feature of being able to operate continuously is lost and it will be necessary to stop at intervals to replenish the electrolyte.

While the rheostat is in operation bubbles of hydrogen and oxygen will be given off. The oxygen will unite with iron electrons forming ferrous and ferric oxide. This will appear as a brown froth and will be carried over the overflow. Because of the liberation of oxygen and hydrogen, the rheostat should be located in a well ventilated space. If located out of doors, the insulated tie rod assemblies should be protected from the weather when not in use and should be given a coat of varnish if their surface shows a dry appearance.

Ohms per cu. in.  
of water by test  
For:

Plate Dimensions

Other Dimensions

1500 hp.	1000 hp.	Height	Width	Thickness	D	E	F	G	H
	500	24	15	0.375	28	33	30	24.1	1
	600	24	18	0.375	28	36	30	24.1	1
525	800	24	24	0.375	28	42	30	24.1	1
650	1000	24	30	0.375	28	48	30	24.1	1
800	1200	24	36	0.375	28	54	30	24.1	1
1000	1500	28	36	0.375	32	54	34	24.1	1.25
1300	2000	36	36	0.25	40	54	42	22.9	1
1650	2500	36	45	0.25	40	63	42	22.9	1.25*
2000	3000	40	48	0.25	44	66	46	22.9	1.5*
2650	4000	40	65	0.25	44	83	46	22.9	1.5*
3300	5000	40	81	0.25	44	99	46	22.9	1.5*

\* A third tie rod is advisable because of width of plates on these assemblies.

# Exchange Your Diesel Maintenance Ideas

Conducted by R. L. GREGORY

*Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.*

## Change in Method of Filtration Improves Condition of Lubricating Oil

By CHARLES L. WIGHT  
Chief Engineer F. W. Stock & Sons,  
Milling Company

**W**E have had some experiences with the reclaiming and filtering of our lubricating oil which may be of interest to some of the readers of this section. In 1939, we installed a Nordberg air-injection unit of 1250 bhp. rated capacity, direct connected to an Elliott generator for supplying power to our mills, which are all electrically driven.

At the time of installation, it was decided to incorporate a nationally known filter without other auxiliaries in order to reclaim our used oils. This filter was a batch filter of 7.5 gal. capacity and it was our practice to draw off approximately two barrels of oil a week from the crankcase, replacing it with clean filtered oil. This gave the operators a chance to re-

condition the dirty oil during the week and have it suitable for use the next week.

As we carried on our maintenance work, most of which is done over the week ends when the mills are not operating, we would remove the inspection doors, and found that the side walls and crank case would have a coating of dirty oil and sludge, due to suspended particles of carbon contained in the lube oil. We felt that only a partial amount of the crankcase oil was doing us any good. It was, therefore, decided to install a continuous filter which would be reconditioning the oil during the hours of engine operation and, during the past summer, we installed the filter shown at the rear of the engine in the photograph below. This filter has given us some remarkable results in the reconditioning of our crankcase oil. This filter, connected close to the sump tank in the unit, gives us three complete changes of filtered oil every twenty-four hours of operation.

A couple of weeks ago, we made some repairs to our engine which necessitated removal of the inspection doors and getting into the sump. We were very pleased to note the absence of the former thin coat of dirty oil and sludge which adhered to the side walls and walls of the crankcase. The walls were clean, the crankcase was clean, and the filter itself was in ex-

cellent condition. The particles of carbon which had remained suspended in the lube oil by our former method of filtration had been picked up by the new filter and withheld from the crankcase oil.

We further noticed that the oil in the crankcase was clear and had much the same color as new oil. This filter, of course, reconditions only the lubricating oil of the crankcase and we still use the batch filter for reconditioning the used cylinder oil picked up by the wiper ring assemblies and other oils used in and about the plant. After watching the operation of our new continuous filter and observing all the results, I am sold on the idea of continuous filtration for lube oil maintenance.

## Reconditioning Fuel Injection Equipment on Air Injection Engines

By C. W. JENNINGS  
Municipal Power Plant, Marshall, Michigan

**AS** an interested reader of DIESEL PROGRESS and particularly of this section, I am submitting a summary of the experiences which we have had on the above subject, for I feel that they might be of interest to members of the trade.

The replacement of fuel injection equipment on air injection units, which is necessitated by wear and continual grinding in of the parts constitutes a considerable investment. This investment, along with the inability to secure these replacement parts promptly, due to present war restrictions, led us to try and to adopt the following method of reconditioning these parts on our three plant units. The results have been most satisfactory.

The first item on attempting this job is to secure a reamer of the proper size and angle to reseat the fuel needle valve and the atomizer. If you do not have such a reamer in your plant equipment, the manufacturer of your engines will gladly loan you one upon request.

Upon procurement of this reamer, the fuel injection equipment is entirely dismantled, cap and flame plate removed from the end of the

Charles L. Wight installed a continuous lube oil reclaimer, extreme left, for his 1250 hp. Diesel.



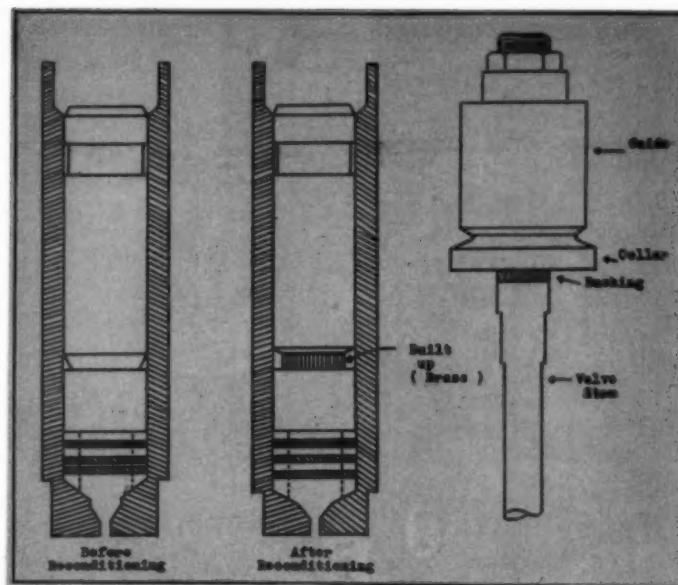


asing, and the fuel needle valve and atomizer also removed, leaving the bare casing. The reamer is then placed securely in a lathe chuck and, operating at slow speed, the seats in the casing are recut to a clean, smooth surface which can be easily ground to the proper fit. After completing the reaming of the seats, we replaced the fuel valve, atomizer, and bushing in the casing to ascertain whether the top of the latter was too low after reaming. This is very likely to be the case and was on our job. To correct this condition, we again removed the bushing, fuel valve, and atomizer and dismantled the atomizer, removing rings and spacers. We then built up the top of the atomizer by brazing on from  $\frac{1}{4}$  in. to  $\frac{3}{8}$  in. of brass. This allowed enough stock for re-machining. One item must be watched in this process of building up the atomizer body, and that is to be careful not to get any of the brazed material into the air passages of the atomizer which would necessitate redrilling of these passages.

Completing the building up of the atomizer body, we remachined the built up part, keeping the outside diameter of this part a trifle smaller than the atomizer body to provide suitable passage for the fuel oil. We were also very particular to see that no flux remained in the fuel oil grooves. Our next step was to machine out the inside diameter of the built up section, to the proper fit. The tolerances allowed on both the inside and outside diameters of the finished built up part must be left to the judgment of those doing the machine work inasmuch as this will vary with different units. Upon completion of the machining of the built up atomizer body, we placed the bushing in the lathe and refaced the lower end of it at the point of contact with the atomizer and to the proper angle. The bushing and atomizer were then reassembled and before replacing them in the casing, the upper plain surface of the bushing was either blued or chalked. With these parts back in the casing, the bushing was turned around slowly by hand in the casing. Upon removing the bushing again from the casing, we found it distinctly marked near the top. Measuring down from this mark to the low side of the chamfer, at the top end of the bushing, gave us the exact amount that would have to be further turned off the built up portion of the atomizer body in order to secure the proper overall length of the assembly. In turning off this additional amount, we allowed a tolerance of  $1/64$  in. for final grinding in.

We were then ready to recondition the fuel needle valve. We removed the guide and collar

Sketches show method of re-conditioning fuel injection equipment for air injection Diesels.



and drilled a small center hole in the end of the needle valve. The needle valve was then placed in the lathe and, when found to run true, was refaced at the same angle as the seat. This is usually a 70 degree angle. The guide ends were also refaced to assure better alignment and the collar was refaced by means of a tool post grinder.

The fuel needle valve was then ground into its seat and also the atomizer, upon completion of which the whole was reassembled with flame plate and cap in place and the assembly replaced on the head. Upon assembly of the complete equipment, you must ascertain whether the fuel needle valve is of proper length. This is accomplished as follows: The valve guide should hold the spring casing up about  $\frac{1}{4}$  in. above the bushing casing. If it does not, due to the needle valve being too short, place two  $\frac{1}{4}$  in. blocks under the spring casing and, with it held in place, have a helper move the needle valve up and down by hand, being sure that the guide just contacts the bottom of the spring.

By means of a scratch awl, the amount of travel of the fuel needle valve should be marked on the side of the stem. The length of this travel determines the amount that must be added to the length of the fuel valve. If the fuel valve stem is found to be too short, proceed as follows:

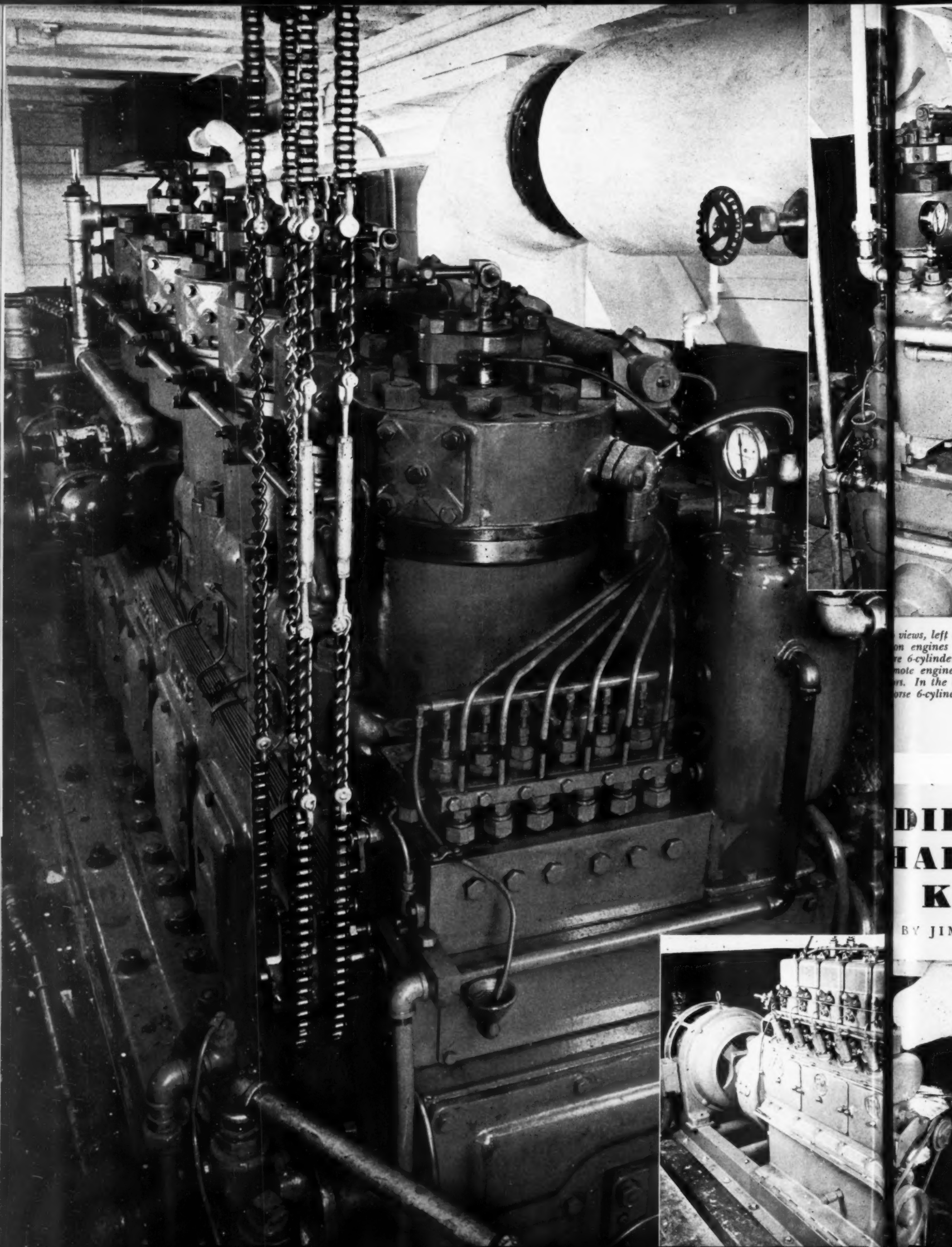
Remove the complete assembly, taking off the guide and collar from the fuel needle valve. A steel bushing must now be made to bring the fuel valve to its proper length. This bushing must have the same outside diameter as the upper part of the fuel valve, and the inside diameter must be such that it will fit snugly on the stem. The length of the bushing must

correspond to the travel of the stem previously taken with the scratch awl. Upon completion of the bushing, the whole can be assembled as shown in the above drawing. Before replacing the fuel needle valve back in the casing, it is suggested that it again be placed on the lathe centers and checked for trueness.

Before final reassembly, make sure that the point of the needle valve does not protrude too far through the flame plate, which may result from grinding and reseating. If this occurs, this point can be retouched with a fine emery wheel and finished with compound. I have found that Carborundum H40 Medium and H40 light is very effective in putting on the final touches to valves and seats.

The whole is now ready for final assembly. To attest to the success we have had with this procedure, I may state that two of our units have been in service for twenty years and a third for about six years. All units have the original casings, bushings and atomizers, although we have had new fuel needle valves. Since adopting this procedure of reconditioning this equipment, however, we have salvaged fuel valves formerly discarded, reconditioned them and they are now in service.

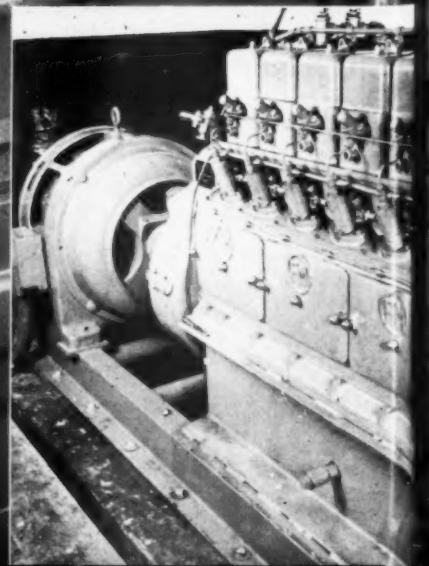
Mr. Didier's suggestion on these valves, which appeared under this heading in the November issue of DIESEL PROGRESS, can well be incorporated in our method, and takes care of the phase of the worn stem of fuel needle valves. I might mention that I experimented with one set of worn needle valve stems, and had them built up by the metal spray method. We encountered considerable corrosive action at the point of contact with the packing, however, which leads me to prefer Mr. Didier's method of brazing and returning the stems.



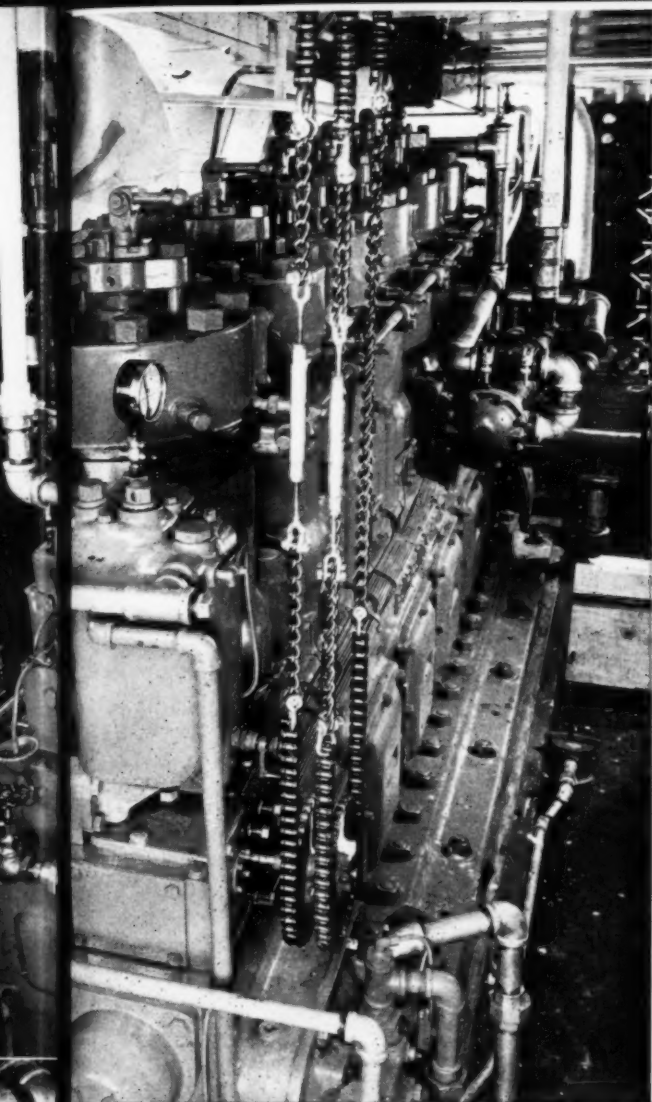
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# DIESEL HAR K

BY JIM







Views, left and above, show the port and starboard Diesel engines in the unique kelp harvester "El Capitan." The 6-cylinder units, each developing 180 hp. at 450 rpm. Remote engine control gear leading to pilot house, Manzel Bros. In the bottom insert is seen the auxiliary unit, a Fairbanks-Morse 6-cylinder, 60 hp. Diesel with FM 30 kw alternator.

## DIESELS HARVEST KELP

BY JIM MEDFORD

**"M**ACROCYSTIS pyrifera" is the fancy name of a species of plain kelp which, when scientifically processed, gives the world improved livestock, better poultry and eggs, even more bodily vigor to the man in industry or on the street.

Extending from the six to the twenty-plus fathom line on rocky bottom, extensive marine jungles of the green weed, in addition to giving natural protection to the beach, are the initial source of a well established Southern California industry—vitamins and minerals for bodily health.

To harvest the tops of the long tendrils, the depth of cutting being regulated by state law and supervised by the Department of Fish and Game, the harvester must at times go considerable distance off shore. Rocky islands make an ideal spot for kelp to thrive and, regardless of

water depth, the stems seeking light reach the surface. It's a matter of getting there, cutting, loading and getting back to the processing plant while the stuff is fresh. Sounds simple, but there's the retarding factor of distance and the usually heavy swells on the cutting grounds. The progressive Kelco Company of San Diego decided to improve on the ordinary procedure of towing an unpowered barge or harvester to the grounds by constructing the 100 ft. by 25 ft. Diesel propelled, Diesel-electric operated *El Capitan*—the first of its kind—using three Diesels, two for propulsion and the other on a generator hookup.

For propulsion, twin 6 cylinder 8 $\frac{3}{4}$  in. bore, 10 $\frac{1}{2}$  in. stroke, two-cycle, 180 hp. at 450 rpm., Fairbanks-Morse Diesels are installed. These are the direct injection type with improved back-flow scavenging for lower fuel consumption and each engine carries Certificate of Qualification by American Bureau of Shipping. Pressure lubrication is fully automatic to all moving parts including Pickering governor housed in the forward end of each engine. Cooling system is of the closed type using fresh water through shell and tube heat exchanger mounted on each engine with by-pass arrangement for controlled cooling without the use of thermostats, the watch engineer manually regulating the raw sea water flow, by means of valves, to maintain jacket water at 120-140 degrees. Starting air is supplied by a single-acting, single-stage water-cooled compressor operated by an eccentric on the main shaft. Full pilothouse control is part of the installation.

The third Diesel is a F-M 6 cylinder, four cycle, 60 hp. engine direct connected to marine type, 220 volt, F-M alternator rated 30 kw. at 80 per cent power factor, both mounted on steel sub-base for proper alignment of units. This engine is started by same air supply as main engines, also is fresh water cooled. All three Diesels have water cooled exhaust manifolds for reduction of engine-room temperature, a feature of Fairbanks-Morse installations for marine service. Alnor pyrometers are provided for each engine exhaust. Main and con-rod bearings can be inspected and adjusted by removing large plates on sides of engine, an important feature of this model. Additional equipment items include: governors by Pickering; lubricators by Manzel Bros.; Alnor pyrometers by Illinois Testing Laboratories; gauges and thermometers by U. S. Gauge; and water vales by Crane.

## MINOR DETAILS OF MAINTENANCE

By R. L. GREGORY

**S**EVERAL years ago, while in the office of the Chief Engineer of one of the Nation's largest steel mills, my attention was called to a large plaque which hung over his desk. On this plaque in bold letters were these words. "Be Positive, Do Not Guess, and above all take nothing for granted."

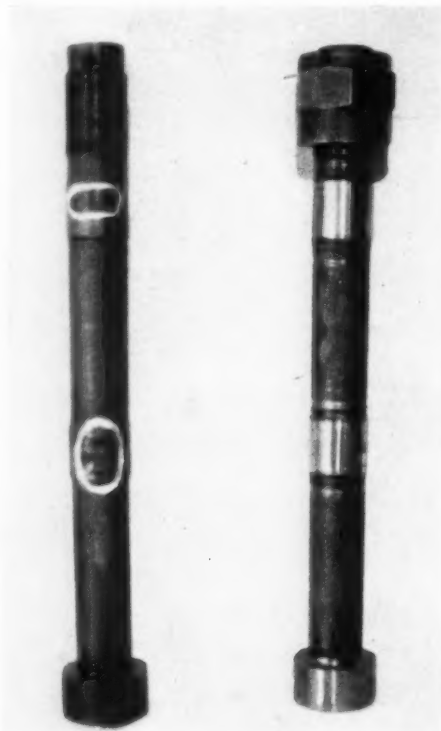
This seems to the writer to be a very appropriate slogan for all of us to adopt at any time, but more particularly now during the increased pressure under which we are laboring in our operating and maintenance programs. In the rush of greater production, we are all very likely to lose sight of the importance of the minor phases of maintenance, while focusing our attention to the major problems. The human race is one of born gamblers, willing to take a chance at all times, but this characteristic has no place and should be foregone in the operation of our maintenance programs. We should never take for granted conditions which might vitally effect the operation of the units under our care. In bringing this point to you, I would like to illustrate it by giving specific instances where chance or taking conditions for granted might prove disastrous.

In the accompanying illustration is shown two connecting rod bolts. The one on the left was recently replaced in the connecting rod bearing of a three stage compressor; the one on the right is a new bolt. To the average layman, the bolt on the left would appear to be in as good condition as that on the right. It is straight, the threads are in good condition and, from outward appearances, the bolt shows no defects. Upon examination, however, of the places marked by the white rings, it was apparent that crystallization was beginning to effect these areas and there were signs of fatigue.

Quoting the manufacturer's instructions on this particular part, we find this phrase under the care of connecting rod bearings! "These bolts

\* Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.

should be renewed after 20,000 hours operation." Many an engineer possibly would have been skeptical of this statement, especially if he had tapped this bolt, found it tight, or even had removed it and inspected it. Then he might have replaced it and might have gotten



by with no ill results until the next inspection, provided that inspection was in the near future.

But the point is that the manufacturer recommended that these bolts be replaced after 20,000 hours' operation. There were no reservations included in that statement and consequently that recommendation was carried out.

The manufacturer did not guess nor did he take a chance on the lifetime usefulness of those particular bolts. His designers had the analysis of the material used in these particular bolts. They knew the tensile strength of that material and they also knew these particular bolts were subjected to certain stresses and strains in

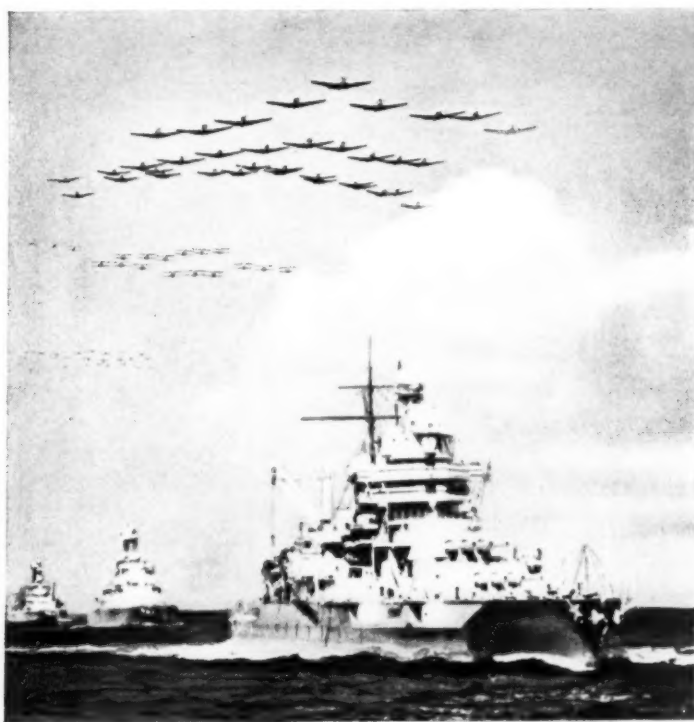
normal operation. From this information, the felt that the margin of safety under which these bolts would normally stand this stress and strain was limited to 20,000 hours, without showing vital fatigue. Later inspection showed this situation to be correct.

I do not wish to infer that this would hold good in all instances. Sometimes defects, unforeseen, appear in metal. The strains and stresses increase due to conditions beyond the manufacturer's control and the life of material do not live up to the expectancy given them by the manufacturer. This is the most universal cause for accidents. But, when the manufacturer stated to replace these bolts after 20,000 hours' operation and they had performed that function for which they were so designed, the proper thing to do was to take no chance and replace them.

Suppose they had been replaced and, after a few hundred or, at the most, a thousand hours of operation, one had suddenly broken while the unit was in operation. The results can hardly be estimated, since the breakage of a connecting rod bolt might result in a cracked or broken cross head, cross head guide, a bent connecting rod, sprung shaft, a ruined bearing or any number of additional injuries to other parts of the unit. This along with the outage incurred, curtailment of production from the unit, and the expense of repairs would result in considerable cost.

In the case of safety valves and warning alarms we find equipment is too often just taken for granted. Most units today are equipped with safety and warning alarm systems, demanded by the insurance companies as a safe-guard against accidents. The starting air and blast bottles, lube oil systems, air coolers, pressure tanks where used, and storage tanks are all equipped with safety relief valves. Take the time to clean and check these valves for designated pressures, while doing regular maintenance work. Most of us, I fear, just take for granted . . . And now please turn to page 52 . . .





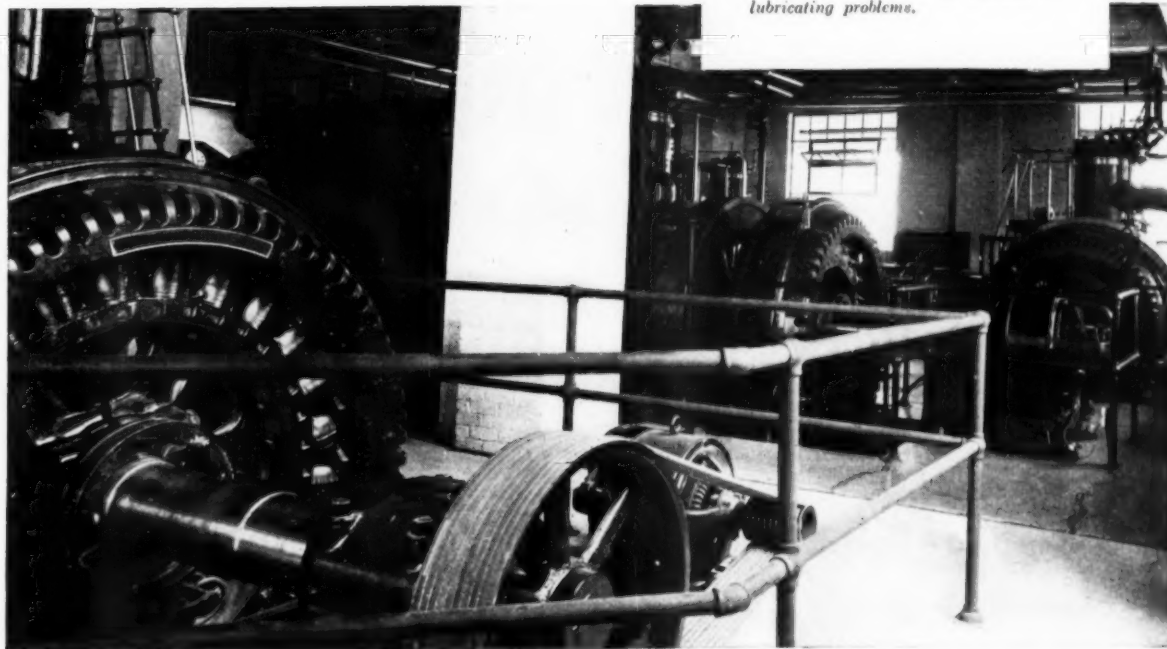
### RESERVE POWER

is as decisive *at home* as at the Front. To keep **DIESEL** output adequate to wartime power demands, use . . .

### .....SINCLAIR RUBILENE OILS.

These sludge-resistant oils provide lasting lubricating film, complete piston seal, and promote full power output, with negligible wear, under all load conditions.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



## SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

SINCLAIR REFINING COMPANY (Inc.)

2540 WEST CERMAK ROAD  
CHICAGO

10 WEST 51ST STREET  
NEW YORK CITY

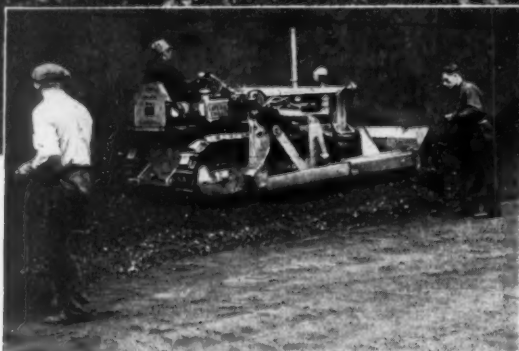
RIALTO BLDG.  
KANSAS CITY

573 WEST PEACHTREE STREET  
ATLANTA

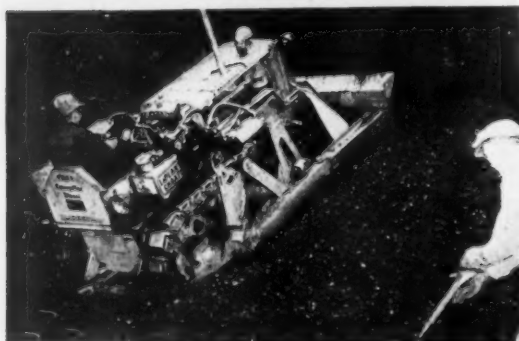
FAIR BUILDING  
FT. WORTH



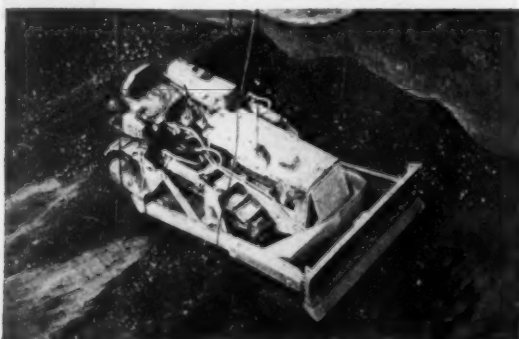
*Above: Caterpillar Diesel tractor leveling the stock pile of a large industrial plant on Lake Ontario in Canada. Below: Diesel tractor with La Plant-Choate Trailbuilder accomplishes complete cleanup of ship's hold by a twelve-ton digging bucket.*



*One hour's time is saved in unloading a coal boat with the aid of this Diesel tractor.*



*The tractor is a time saver in unloading both coal and ore boats.*



*Lowering the tractor into the hold of a coal boat.*



## **DIESEL TRACTORS SPEED COAL UNLOADING**

**I**N war time, each hour lost is really a relieve for the Axis—and each hour gained speeds the day when freedom will again reign, undisputed. At a large industrial plant on Lake Ontario in Canada, between one and three hours is saved this year in unloading and cleaning up the holds of coal boats. A Caterpillar Diesel tractor equipped with a bulldozer is lowered into the holds of the coal boats, and 'dozes the coal into piles so that use of a twelve-ton digging clamshell

bucket is possible throughout the unloading operation. Previously it had been necessary to follow the 12-ton bucket with a six-ton cleaning-up bucket but, with the tractor on the job, use of the clean-up bucket is curtailed. This speeds up the unloading job and, in turn, enables the coal boats to make more trips per year with their precious cargo. In addition, the industrial plant uses a D7 tractor and blade to level and compact stock piles, making it possible to stock more coal.

**Aircraft**  
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Company. I  
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Georgia, for  
line Railroad



## Aircraft Roller-Chain Handbook

THE Diamond Chain and Manufacturing Company of Indianapolis has just published its Engineering Handbook No. 641, giving complete information on the selection, installation, and maintenance of precision roller-type chains and sprockets for aircraft usage.

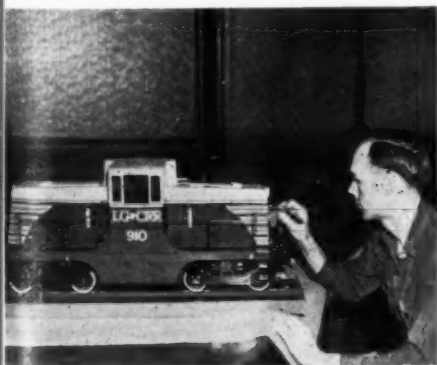
The principles which should govern the selection and specification of chains and sprockets for aircraft and aircraft armament are outlined. Complete data are given on a range of chains which experience has shown to be particularly suited for aircraft service.



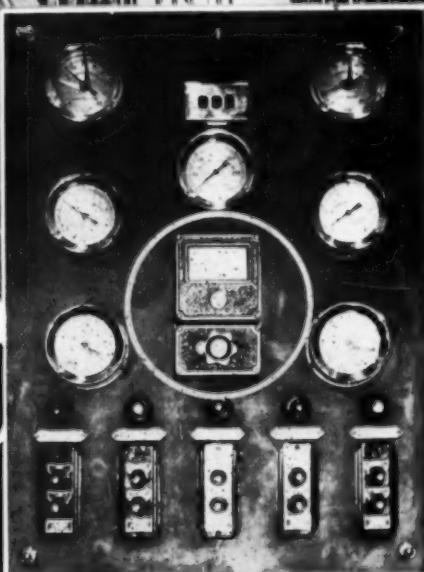
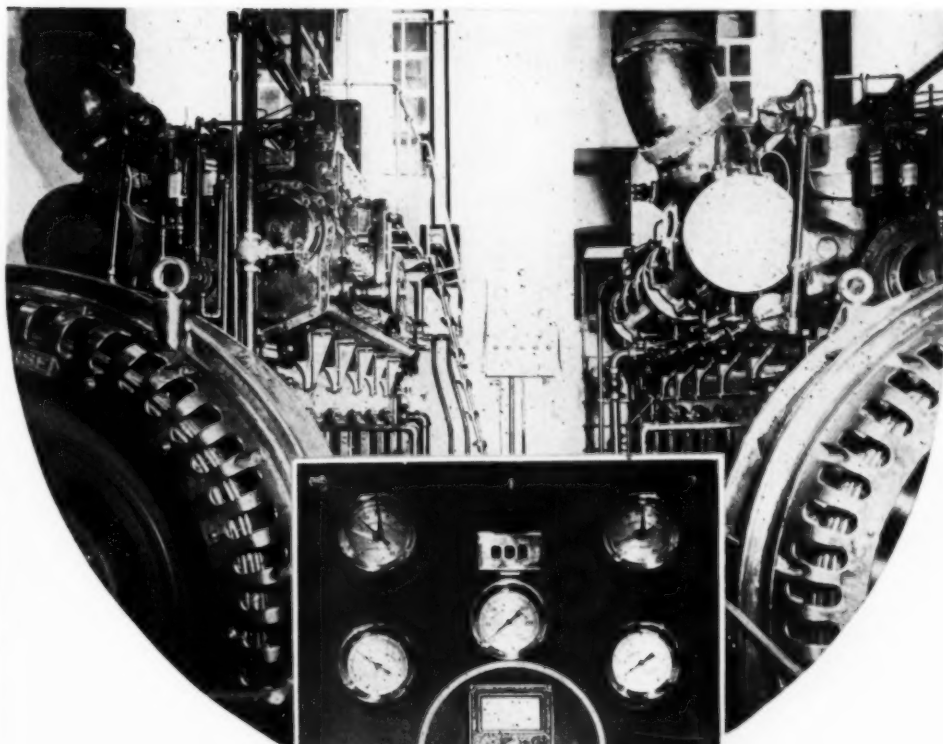
Engineering Handbook No. 641, will be of interest to those who are concerned with the design, specification, procurement, inspection, installation, and maintenance of chains for aircraft. It is available on request.

## Locomotive Model Built by G-E Welder

DON FULLERTON, a welder at one of General Electric's shops, makes models in his spare time of some of the locomotives built by the



Company. Here he is putting the finishing touches on a model of a 44-ton Diesel-electric locomotive before it was shipped to Atlanta, Georgia, for exhibition at the American Short-line Railroad Association meeting recently. The



A single "Alnor" multi-point pyrometer, illustrated here, insures the performance of two Fairbanks-Morse Diesels—totaling ten cylinders—in Bourne Mills, Fall River, Massachusetts.

## - ASSURED PROTECTION FOR CONTINUOUS OPERATION

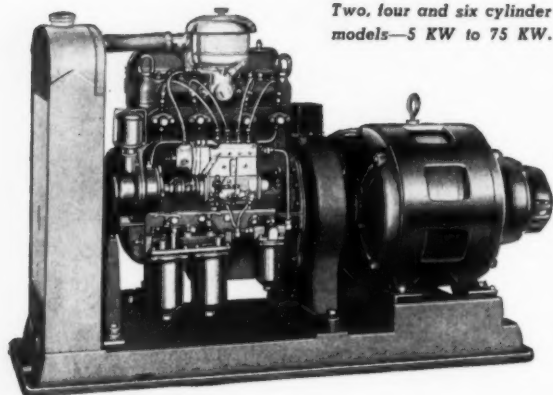
Safeguard Diesels operating almost continuously under 90 and 100% of rated capacity—as those shown above are doing. "Alnor" assures this protection—detects trouble before it enforces shutdown. Ruggedly built—accurately calibrated, Alnors provide the most indispensable and inexpensive Diesel insurance you can buy.

Specify and Buy "Alnor"



**Illinois Testing Laboratories Inc.**  
Don't Guess Know!  
**423 NORTH LaSALLE STREET, CHICAGO, ILLINOIS**  
MANUFACTURERS OF "ALNOR" AND PRICE INSTRUMENTS • PRODUCTS OF 42 YEARS' EXPERIENCE

## U. S. PRODUCTS MUST GIVE SERVICE



Two, four and six cylinder models—5 KW to 75 KW.

Our traditional slogan, "U. S. Products Must Give Service," means more today than ever. For now, on the vast fighting fronts, U. S. Electric Plant performance is playing a vital role in winning battles—saving lives. Electricity is the nerve center of modern warfare!

UNITED STATES MOTORS CORPORATION  
OSHKOSH WISCONSIN

# U.S. DIESEL

## ELECTRIC PLANTS

**THEY'RE ALL SERVICED WITH HALL**

Wherever Diesel engines are in use you'll generally find the HALL Wet Type Diesel Valve Refacer and HALL Model ED ECCENTRIC Valve Seat Grinder being used to maintain original factory standards of precision, finish and performance... HALL Grinders are also used by many leading engine manufacturers in their production... If only HALL equipment is good enough for production, can anything else be better for maintenance? Write the factory today for complete information on HALL Diesel Valve Servicing Equipment.

**THE HALL MANUFACTURING CO., Toledo, Ohio, U.S.A.**

# HALL

model is complete even to such features as sliding windows, adjustable shutters, and swivel seat, and is built to the scale of one inch to one foot. The model does not run under its own power, although it is complete enough to move back and forth on the track.

### FOR VICTORY



**BUY UNITED STATES WAR BONDS AND STAMPS**

### Army-Navy "E" to Edwards Division of Rogers Diesel and Aircraft Corporation

AT SANFORD, N. C., on November 30, 1945, The Edwards Company and its employees were officially awarded the famous Army-Navy "E". Thus, the Edwards Company became the fourth company in the State of North Carolina to be so honored. Edwards is a division of the Rogers Diesel and Aircraft Corp., whose offices are in New York City.



Here you see Mr. Ralph B. Rogers, President of the Rogers Diesel and Aircraft Corp., receiving the "E" pennant from General J. V. B. Metts.

### Honan-Crane Automatic Clarifier For Cutting Oils and Coolants

IN April of this year, the Honan-Crane Corporation announced the manufacture of a new Automatic Clarifier for the removal of abrasives from oils and coolants used in boring, cutting, grinding, honing, and like operations.

Since the machine has been purchased and installed, it has been operating at a scale of one inch to one foot.

has proved to be of high quality and has been completely protected from oils.

1. Allow 1
2. Extend
3. Reduce
4. Reduce
5. Allow
6. Permit

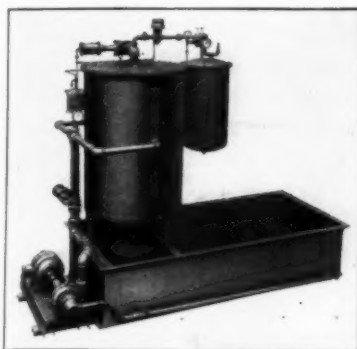
The outstanding Automatic

1. Cycle of
2. The cl
3. Oil used
4. Flexibili
5. Every fe

For the complete Honan-Crane Automatic Clarifier, write to Honan-Crane, 1000 Avenue, L. This bulletin gives the operation.

**New Die Concentration BETTER Lubrication**

Since that time, this clarifier has been purchased and gone into operation in great many plants, most of which are engaged in large scale operations on war work. This machine



has proven of value in maintaining both the quality and speed of production and has definitely proven that the removal of abrasives from oils and coolants will:

1. Allow better finish of products
2. Extend the life of tools
3. Reduce time lost in grinding tools and dressing stones
4. Reduce rejects
5. Allow more continuous operation of machines
6. Permit finish to be directly controlled by grade of stone. (Loading of stones does not have to be allowed for)

The outstanding features of the Honan-Crane Automatic Clarifier are:

1. Cycle of operation is entirely automatic
2. The clarifier is self-cleaning
3. Oil used for cleaning the filter screen is separated from the mud and returned to the system. Practically no oil is lost.
4. Flexibility of design allows the clarifier to be keyed to the exact conditions that are required in any given operation.
5. Every feature of construction has been carefully engineered to give years of trouble free service.

For the complete story on this clarifier write Honan-Crane Corporation, 202 Indianapolis Avenue, Lebanon, Indiana, for Bulletin 26. This bulletin contains complete specifications, gives the construction features and cycle of operation. All points are well illustrated.

#### New Diesel Fuel Concentrate Compound

BETTER fuel combustion and top-cylinder lubrication for Diesel engines are provided in



Hydraulic Torque Converter  
(Lysholm-Smith Type)

Hydraulic Power Take-off

## WHAT'S *Your* BIG IDEA ?

After-the-war products are certain to be revolutionary in their conception. Hints of new things on the drawing board forecast tools, implements and machinery that will immediately obsolete the equipment now in operation.

Closely allied with these new products is the apparent wide application of hydraulic drives. Wherever a driving and a driven unit must be linked together and a smooth, steady flow of power is vital, engineers are investigating the two types of hydraulic drives offered by the Twin Disc Clutch Company.

1. The Hydraulic Torque Converter  
(Lysholm-Smith Type)
2. The Hydraulic Coupling

Each of these provides a connecting link

that cushions cyclic variations and shock loads. Each has the advantage of picking up the load without the need of gear shifting, but **ONLY** the Hydraulic Converter has the added advantage of providing torque multiplication (approximately five times the engine's torque). Thus, with the Torque Converter, heavy loads that would be beyond the engine's capacity to start without resorting to gear shifting are smoothly and easily handled. No jerking . . . no snapping of lines or cables . . . no sudden shock loads which might stall the engine.

Why not ask the Hydraulic Division, Twin Disc Clutch Company, Rockford, Illinois, for full particulars? A competent engineering department invites your question.

**TWIN DISC CLUTCH COMPANY • RACINE, WISCONSIN**



a product development of E. F. Houghton & Co. known as Diesel Fuel Concentrate.

This concentrate, used in the proportion of five gallons per 1,000 gallons of fuel oil, is a blend of high quality oils with stable synthetic organic compounds of high boiling point. It is said to aid materially in solving Diesel engine problems of ring and valve sticking, sludge or gum deposits, carbon, injector contamination and piston or cylinder wear. Its high boiling point enables it to form a seal around valve

stems and top piston ring assemblies, reducing blow-by and exhaust temperatures.

A smoother running engine, with freer valve action, less gum and lower maintenance cost, is said to result from the use of Diesel Fuel Concentrate. A descriptive folder is available by writing E. F. Houghton & Co., 303 Lehigh Ave., Philadelphia, Pa.

#### Calling All Horsepower

"CALLING All Horsepower," a program de-

signed to save critical war materials and to get maximum production out of every motor, is announced in a new twenty-page booklet by Westinghouse Electric and Mfg. Company.

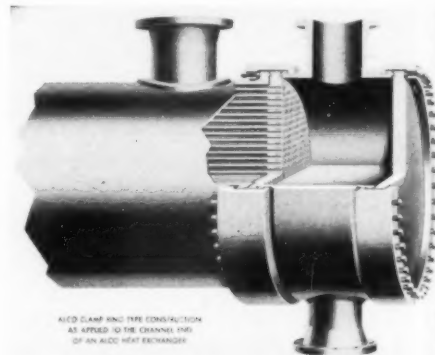
Undertaken at the suggestion of the War Production Board, the "Calling All Horsepower" program points out how motor overload capacity can be used to get more production from every available unit of horsepower, and at the same time effect huge savings in critical materials.

Six wartime application recommendations are listed and discussed. Accompanying charts and illustrations give specific information on pounds of war material which can be saved by each method. Recommendations are to take advantage of overload service factors built into motors, plus favorable temperature conditions; to take advantage of favorable voltage and frequency conditions; to use standard open sleeve-bearing motors in place of fan-cooled or splash-proof motors wherever conditions permit; to use highest speed motors permitted by application; to substitute a-c motors wherever possible; and to match control to motor on the basis of horsepower rating.

A copy of booklet B-3188 may be secured from department 7-N-20, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

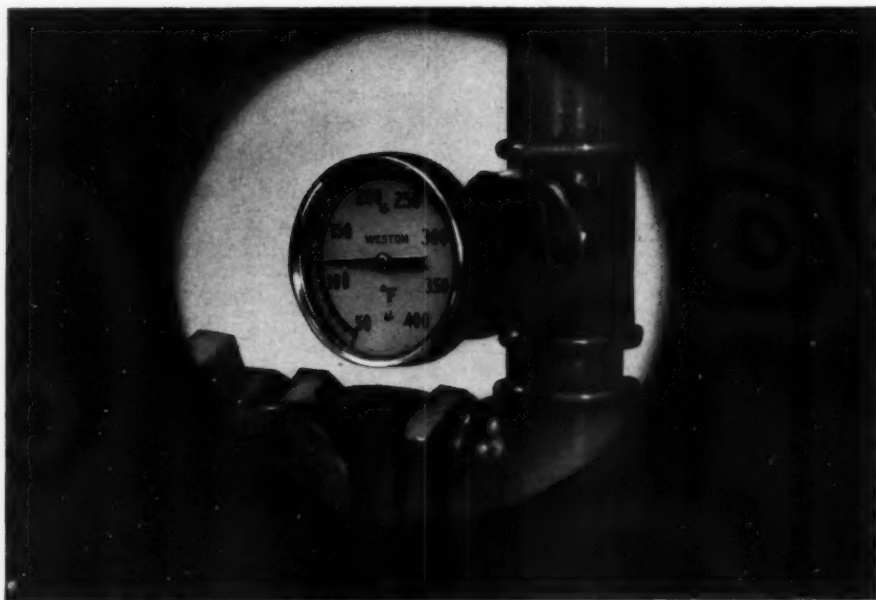
#### Alco Bulletin Describes Clamp Ring Joint as Applied to Heat Exchangers

ALCO PRODUCTS Division of American Locomotive Company has issued Bulletin 1032 describing and amply illustrating the use of the Alco Clamp Ring Joint to heat exchanger construction. Some of the features of this construction are: elimination of large flanges on shells resulting in weight reduction of 5 to 15%; short set bolts which do not elongate



appreciably under operating temperature; direct line gasket compression eliminates cantilever action; bolting need not be removed from the clamps when dismantling and many others

## EASY ON THE EYES!



### Ruggedness and dependable accuracy, too, distinguish the ALL-METAL THERMOMETER

Readability in an indicating thermometer is an outstanding advantage if full dependence can be placed on each reading. Thus the WESTON thermometer has been widely adopted throughout the process industries: because it provides both these essential factors...readability and dependability...without compromise. It's simple, all-metal temperature principle...minus gases, liquids, capillary and involved mechanisms...assures "on-the-dot" accuracy over a far longer period of time. In addition, this all-metal construction safeguards against failures due to vibration or over-ranging. *You're more certain of your reading...with a WESTON.*

WESTON all-metal thermometers are supplied in types and diameters for most industrial applications and in stem lengths from 2½ to 24". Accuracy, over the entire scale, guaranteed within 1% for the industrial models...½ of 1% for the laboratory model. Literature gladly sent on request, although production facilities are at present devoted solely to the war effort. Weston Electrical Instrument Corporation, 579 Frelinghuysen Avenue, Newark, New Jersey.



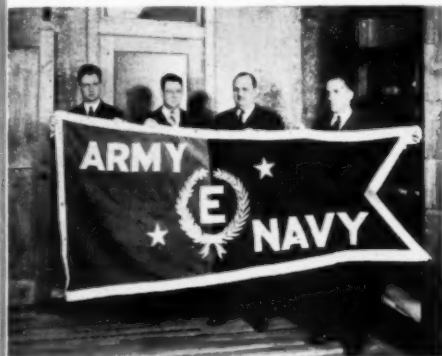
## WESTON All-Metal TEMPERATURE GAUGES

This eight page bulletin is available to those interested upon application to Alco Products Division, American Locomotive Company, 30 Church St., New York City.

### Army-Navy "E" With Two Stars To Bantam Bearings

THE Army-Navy "E" pennant with two stars, continued recognition for outstanding war production has been awarded Bantam Bearings Corporation. The Bantam plant is the first in Indiana and one of four in the entire midwest to receive two stars on its banner for its service in war production.

The presentation was made by Lieut. Commander Richard Wagner of the United States Navy's Midshipmen School at the University of Notre Dame. It was received on behalf of the company by R. B. Nichols, Vice-President and General Manager and Orville Zimmer, President of the Bantam employee's union.



In the picture are (left to right) Ensign H. B. Miller, R. B. Nichols, Vice-president and General Manager, Lieut. Commander Richard Wagner and Orville Zimmer, President of the Bantam C. I. O. local who accepted the burgee on behalf of the company employees.

### West Coast Diesel News

RECENTLY completed by the San Diego Marine Construction Co., San Diego, California, the 90-ft. tug *San Miguel* went into service without the usual shakedown trip. Emergency sent her on a 4,000-mile jaunt south after a disabled tuna clipper. Returning to port her chief engineer, Howard Stagg, reported to her owners, the Star and Crescent Boat Co., that her 465 hp. Washington Diesel "Ran like a watch all the way."

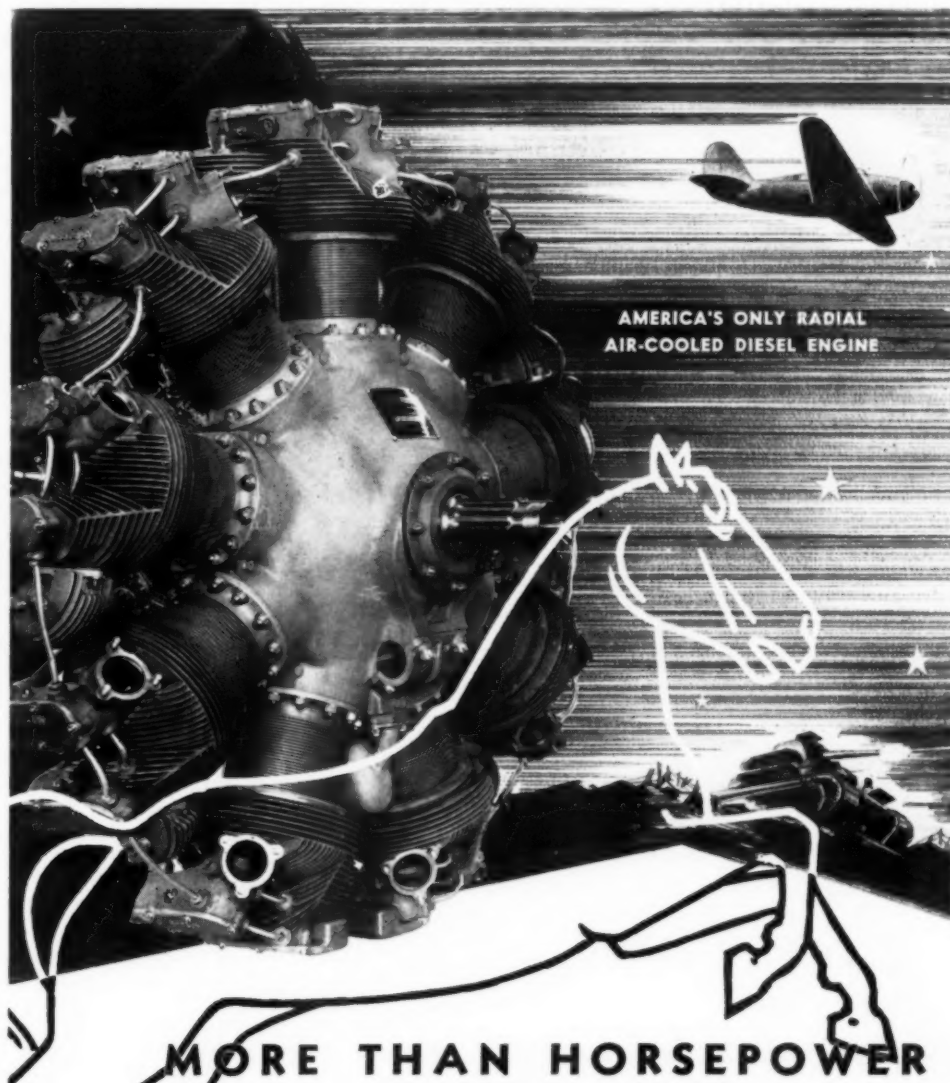
THE 65-ft. Case Construction Co. towboat, *Edna*, has been repowered with a Caterpillar Diesel with 3 to 1 Twin Disc gears. Engine has both electric and gasoline engine starting.

TWO heavy duty towing vessels recently completed by the Columbia Construction Co., Terminal Island, California, for service on the Los Angeles-Long Beach breakwater extension, are 88-footers, powered with 600 hp. Washington Diesels. Auxiliaries are Superior Diesels direct connected to Westinghouse generators. Pumps are by Fairbanks-Morse.

WASHINGTON 6-cylinder, 365-hp. Diesels at 350 rpm. have been selected to power two new 83 ft. towboats by the Associated Shipbuilders

of Seattle, Washington, for the Puget Sound Bridge and Dredging Co. Auxiliary equipment includes Lister Diesels and F-M pumps.

WITH Fairbanks-Morse main and auxiliary Diesels, the 65-ft. *Sunset*, recently launched by the Hollinger-Millican yard at San Diego, California, for the Bregente Bros., has a 240 hp. main engine, and two auxiliaries of 60 hp. turning General Electric generators. Engine exhaust temperatures are checked with Alnor pyrometers.



AMERICA'S ONLY RADIAL  
AIR-COOLED DIESEL ENGINE

**MORE THAN HORSEPOWER**

FOR TANKS, PLANES and SHIPS

No Fire Hazard  
Lower Fuel Consumption  
Increased Striking Range  
Greater Stamina

Dependable Operation  
Instant Response to the Throttle  
No Ignition System

Lower Cost of Fuel  
Constant Torque at All Speeds  
No Radio Interference

ESTABLISHED 1919



**Guiberson U.S.A.**

GUIBERSON DIESEL ENGINE COMPANY  
Dallas, Texas

\* THE GUIBERSON CORPORATION  
Aircraft and Heater Division

**T**WIN Fairbanks-Morse 6-cylinder, 12 in. x 15 in., 600 hp. Diesels have been selected to power several of the 127-foot new Army towboats designed by Lee Coolidge working with the Army Transport Service. Equipment includes Ross heat exchangers, Alnor pyrometers. Several West Coast yards have tendered successful bids.

**T**HE dragger *Oceania* constructed by the Caulkins yard at Otis, Oregon, for Varells and Cune, is powered with a 6 cylinder, 145 hp. at

1350 rpm. Waukesha-Hesselman engine with Twin Disc clutch and reduction gears. The 600 ft. craft's auxiliary is a 10 hp. Palmer Diesel. Her trial test gave slightly more than ten knots.

**T**HE Alameda plant of the United Engineering Company, San Francisco Bay, recently launched the steel ocean-going tug *Cree*, the first of several to be built for the navy; Diesel-electric drive with General Motors-Allis Chalmers units, and Westinghouse equipment.

**T**HE Buda Company's Canadian West coast agents, Simpson Maxwell Co., of Vancouver, B. C., report sales of two Buda-Lanova Diesels for fish boat installations—Great West Packing Co., Steveston, and S. R. Graham, Pender Harbor—both 45 hp.

**T**HE U. S. Army Engineer Department recently took delivery of an 86-ft. power scow completed in record time by the Maritime Shipyards, Seattle, Washington. Powered with two Caterpillar marine Diesels with Twin Disc gears, it will serve in construction and lighter service on government projects.

### Supervising and Operating Engineers' Section

. . . Continued from page 44 . . .

that these valves will work when called upon to do so.

On air injection units having stages of cooling for the various stages of air compression, each stage should be properly safe-guarded by a good reliable relief valve. Compressed air contains a certain amount of moisture, the natural result of compression. This air, as it passes through the various stages, contains carry over oil from the compressor which, when united with the moisture, forms an emulsion or sludge. This sludge has a tendency to gum up the working parts of a relief valve and corrode the parts and, unless the valve is periodically cleaned to remove this sludge, it often fails to function at the proper pressure or, if it does relieve, the sludge will clog the working parts so that the valve does not completely shut off after the relief action. This often results in unwarranted difficulties, even causing removal of the unit from service until repairs can be made.

Warning and safety alarms are installed on lube oil systems, bearings, cooling water, and some plants even have thermocouples in sections of the generator coils to give warning of a temperature rise above normal operating temperatures. These alarm systems should be checked periodically. An incident of failure in the alarm system on the lube oil pump was recently noted by the writer. The operator on duty, busy with other attendant duties and depending on his warning signals, failed to note that the lube oil pump had become defective due to a broken drive and, before he was aware of trouble, several bearings had burned or been badly scored.

The foregoing are just some of the many minor details which we will perhaps overlook or just

**"IT'S NOT IMPORTANT  
UNLESS IT WILL HELP  
WIN THE WAR."**

**MISTER,  
you said it!**

This is no time for "hair-splitting" or "gingerbread". Chrome trim and plaid upholstery don't fit in with tank-killer turret guns and caterpillar treads.

And how important anything is must be measured in terms of "service rendered" where it counts most.

Our product, the VISCO-METER\*, built up quite a service record in government use through pre-war years. Soon after Pearl Harbor our entire production capacity was enlisted to serve with the gasoline and Deisel engines consigned to Uncle Sam's war uses.

A simple 12 ounce piece of mechanical precision the VISCO-METER\* is doing an *important* job—and doing it

well—guarding these needed and costly engines against lubrication failures. No need to go into the importance of lubrication—that's recognized. The important thing is: *only* VISCO-METER\* can tell visually, (via a continually indicating gauge) the viscosity or lubricating value of the crankcase oil while the engine is in operation. Only VISCO-METER\* can warn in advance of failure—preventing damage and loss of service. So the VISCO-METER\* *is important* and is helping to win the war.

In peacetime the VISCO-METER\* will continue to play an important role. If you are looking forward, a VISCO-METER\* engineer can be most helpful.

**VISCO-METER**  
CORPORATION GROTE ST., BUFFALO, N. Y.

\*Fully covered by U. S. and Foreign Patents



### Announcing Torque M

THE P. A. S. complete line of prising eight capacity from wrenches of a two-handed pound capacity

These wrenches ing or measu equalizing the ing to a prede ing frictional

They are wide and inspection eper beam scales and are g to retain their e. A. Sturtevan particulars.



take for granted in our maintenance work, yet they will and do cause nearly as many shut-downs and outages as do troubles arising in the major parts of our units. In carrying on maintenance work, therefore, don't overlook the little things.

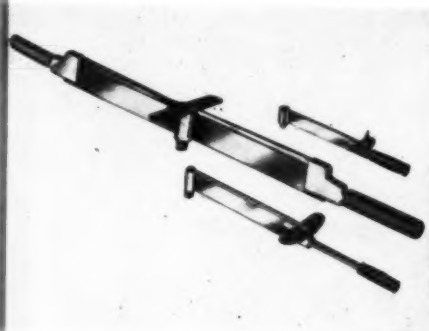
## FOR VICTORY



**BUY  
UNITED  
STATES  
WAR  
BONDS  
AND  
STAMPS**

### Announcing Complete Line of Torque Measuring Wrenches

THE P. A. Sturtevant Co. announces a complete line of torque measuring wrenches comprising eight models which range in size and capacity from small instrument building wrenches of a few inch pound capacity to great two-handed torque wrenches of 7200 inch pound capacity.



These wrenches are being widely used for gauging or measuring torsional force, as when equalizing the set of screws or nuts by tightening to a predetermined torque, or for measuring frictional drag in motors or mechanisms.

They are widely used in both manufacturing and inspection departments. All are of the flat tapered beam type with fixed end and top scales and are guaranteed by the manufacturer to retain their accuracy permanently. Write to P. A. Sturtevant Co., Addison, Illinois, for full particulars.

### New War Time Consulting Engineering Service

TO meet the emergencies brought about by the sharp restriction of high priority metals and of parts replacement, the Metallizing Company of America, 1330 W. Congress St., Chicago, announces the establishment of a new engineering service program designed to assist industry on all problems relating to salvage, conservation of materials, and the use of substitute metals for the more critical ones. This service has been developed as a result of the

demand for information directed to this company about metallizing.

For the past two years, service engineers of this company have been cooperating with the Army, Navy, and Ordnance Departments on highly confidential military applications of the metallizing process. The comprehensive experience and information these men have available has been in no small way a direct contribution to the war effort. The brilliant success a western ship-builder has had in launching new ships



## Clean Oil FOR UNCLE SAM'S "FIGHTING FISH"

WHERE these fellows do their fighting conditions are tough! Material and equipment on submarines have to be able to "take it" . . . *quality* and dependability is what counts. The filtering of lubricating oil on many of Uncle Sam's fighting crafts is the job that Nugent Patented Pressure Filters perform.

For more than 45 years Nugent Filters and Oiling devices have served industry . . . helping to conserve lubricating oils and fuel oils. Today, wartime industries can benefit from Nugent's experience in the field of oil handling and filtration.

Drop us a line . . . perhaps we can help you on your specific oil conservation problems. There's no obligation.



**WM. W. NUGENT & CO., Inc.**

Est. 1897

415 N. Hermitage Ave., Chicago, Ill.

The Nugent Patented Pressure Filter . . . popular for filtering lubricating oil for heavy duty Diesels. This size measures only 38" high yet the patented construction gives it 2904 sq. in. of direct filtering area.



FIG. NO. 1195 MA # 4L

# NUGENT FILTERS

ahead of schedule can partly be ascribed to the recommendations suggested by one of this company's service engineers.

L. E. Kunkler, President of Metallizing Company of America stated, in announcing this plan, "Our consulting service engineers are available to everyone engaged in war work, in addition to the regular service they are rendering present users of the metallizing process. We sincerely hope that industry will unhesitatingly call on these men on all problems of salvage

and conserving high priority metals. To supplement and amplify this service, it is our continued plan to send monthly copies of our engineering process manual reporting all new salvage applications to all users of metallizing equipment, as well as those requesting such vital information.

"By adopting this comprehensive engineering service plan, it is hoped that a speedy solution to each problem can be accomplished, thereby preventing further bottlenecks."

## NOISE ENOUGH TO WAKE THE DEAD



but you can't even

hear it when

**MAXIM SILENCERS**

**are on duty**

Maxim Silencers do such an efficient job of silencing internal combustion exhaust noise that the closest neighbors cannot find cause for complaint. In a plant or power house, too, the elimination of exhaust racket helps make working conditions better. . . . Those at work are not distracted by the constant drumming of exhaust and are less fatigued at the end of the day. From every point of view today, when efficient operation is nationally important, Maxim Silencers are a very sensible investment.



• Maxims make quiet 24 hour operation possible in this municipal power plant located in the center of a small western community. The highest degree silencing is obtained with Maxim MU2 Silencers.

**THE MAXIM SILENCER COMPANY**

94 Homestead Ave.

Hartford, Connecticut

### Mark A. Defibaugh Is New Works Manager for Honan-Crane Corp.

TO supervise its expanded manufacturing program, Honan-Crane Corporation has secured the services of Mark A. Defibaugh who will be Superintendent and Works Manager in Charge of all Manufacturing.

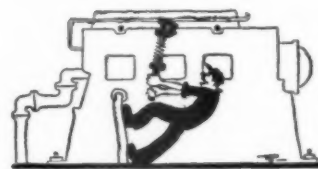


Mark A. Defibaugh

Mark Defibaugh comes to Honan-Crane from The Globe American Company of Macomb, Illinois, where he has been Works Manager for the past six years. Previous to his appointment at Globe American Company he held the following positions:

Superintendent of the Dyne Corporation of Syracuse, New York; superintendent, Sherman Manufacturing Company, Battle Creek, Michigan; Chief Engineer, Service Appliance Company, Schenectady, New York; Experimental Engineer, Altofer Brothers, Peoria; Experimental Engineer, Syracuse Washington Machine Company, Syracuse, New York.

His record in plant supervision has been outstanding and his association with Honan-Crane will contribute greatly to keeping Honan-Crane Oil Purification equipment advanced in Engineering and Design.



### Baldwin Issues The Bulletin

THREE new bulletins are being issued by the Baldwin Division of The Philadelphia

The bulletin describes a method for and machine three standardizing and restraints, and on structures

Contained in the SR-4 Strain Indicator the two instruments information

### FO



Tuthill Ap W. P. HOD chasing agent Chicago, man precision equi

Mr. Hopkins agent for the and prior to system.

New Solv Bunker "Salvage and ACCORDING Research and an Corporation Emulsifying D valuable for i

## Baldwin Locomotive Works Issues Three New Technical Bulletins

THREE new technical bulletins, one describing the company's SR-4 Strain Gage and the other two, the recording and indicating instruments for use with SR-4 Strain Gages, have just been issued by the Baldwin Southwark Division of The Baldwin Locomotive Works, Philadelphia.

The bulletin on the SR-4 Strain Gage which describes an entirely new and revolutionary method for determining stresses in structures and machines, gives detailed descriptions of the three standard gages, their application in measuring and recording dynamic and semi-dynamic strains, and instructions for installing the gages on structures to be analyzed.

Contained in the two other technical bulletins, the SR-4 Strain Recorder and the SR-4 Portable Strain Indicator, are detailed descriptions of the two instruments, installation and operating information for their use with SR-Strain Gages.

## FOR VICTORY



BUY  
UNITED  
STATES  
WAR  
BONDS  
AND  
STAMPS

## Tuthill Appoints Hopkins

W. P. HOPKINS has been appointed purchasing agent of the Tuthill Pump Company, Chicago, manufacturers of rotary pumps and precision equipment for war and industry.

Mr. Hopkins was formerly assistant purchasing agent for the Ordnance Plant at Marion, Ohio, and prior to that, for the Illinois Central system.

## New Solvent Removes Salt and Bunker "C" Fuel Oil For Naval Salvage and Repair

ACCORDING to A. F. Curran, New Products Research and Development Director, The Curran Corporation Gunk P-96, Concentrated Self-Emulsifying Degreasing Solvent has been found valuable for its ability to dissolve, emulsify,

and remove heavy accretions of Bunker "C" Fuel Oil in the presence of salt water. The outstanding feature of this new colloidal emulsifying solvent is that the degreased surfaces are particularly compatible for the application of red lead undercoat.

It is claimed that because of the powerful penetrating and emulsifying action, all traces of oil are made water soluble and need only be sluiced with a water hose to rinse and decontaminate large areas such as the hold of war

ships. For full particulars write Curran Corporation, 6 Pleasant St., Malden, Massachusetts.

## Management Group Named by Guiberson

DIRECTORS of the Guiberson Corporation and the Guiberson Diesel Engine Company of Dallas, Texas, manufacturers of oil field equipment, Army Ordnance material, air cooled Diesel engines for aircraft, tanks and boats, shells for Chemical Warfare Service, and sub-contractors to the aviation industry, have

*What's New*  
in **ENGINE INDICATOR**  
DESIGN AND APPLICATION

**Complete Portfolio**  
42 PAGES  
59 ILLUSTRATIONS  
49 DRAWINGS

**BACHARACH**  
Engine Pressure  
INDICATORS

**CHRONOMATIC**  
Engine Pressure  
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Send me FREE your portfolio telling what is new in Engine Indicator Design and Application.

NAME \_\_\_\_\_ POSITION \_\_\_\_\_  
COMPANY \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_



elected a management committee to direct expanding operations of the two corporations.

Members are Harry S. Zane, Jr., vice president of the firms and manager of their Chicago office since 1940; chairman, Allen Guiberson, president of The Guiberson Corporation and executive vice president of the Guiberson Diesel Engine Company, who was in charge of perfecting the Guiberson air cooled radial Diesel aircraft engine; Alex P. Smith, vice president and controller; and R. D. Wallis, secretary and treasurer. Mr. Allen Guiberson is chairman of the Texas Section of the Society of Automotive Engineers. S. A. Guiberson, Jr., founder of the business, and N. G. Guiberson, vice president, are ex-officio members of the management committee.

#### **New Bulletin On Blackmer Sanitary Pumps**

THE new Bulletin No. 115, issued by Blackmer Pump Company, describes the adaptation of its "Bucket Design" pumps to specialized service in food and beverage processing plants. While the inherent features have been retained of the Blackmer "Bucket Design" which render

these pumps self-adjusting for wear, the new bulletin illustrates various drive arrangements including electric motor drive with single reduction gear; V-belt drive; flat belt drive and variable speed units, each manufactured as a self-contained unit mounted on a subbase. Complete specifications and performance data for liquids of various viscosities are tabulated.

Complete your file of Blackmer Pump bulletins by writing Blackmer Pump Co., Grand Rapids, Michigan, for your copy of Bulletin 115.

#### **American Bosch Appoints Robert C. Mathewson**

THE American Bosch Corporation, Springfield, Massachusetts, announces the appointment of Robert C. Mathewson as Assistant Manager of the company's Branch Office at Chicago in charge of field engineering.

Mr. Mathewson comes to American Bosch from the Buffalo Works of the Worthington Pump and Machinery Corporation with which he has been associated for the past nineteen years and where he has held the position of Assistant Chief Engineer of the Engine Division.

#### **National Supply Division Receives Maritime "M"**

THE National Supply Company's Superior Engine Division at Springfield, Ohio, was officially awarded the United States Maritime Commission "M" December 17, at ceremonies held at the Springfield plant.

Presentation of the Maritime "M" pennant, Victory Fleet Flag, and Maritime Merit Badges was made by Admiral H. L. Vickery, Vice Chairman of the U. S. Maritime Commission. Among the speakers at the ceremonies were Governor John W. Bricker of Ohio, and A. E. Walker, President of the National Supply Company.

#### **New Catalog Describes Micromax Frequency Recorders**

MICROMAX Frequency Recorders and Indicators are described in a twenty-page catalog just issued by Leeds & Northrup Company. This new catalog supersedes the previous (1938) publication on this subject.

Widely used in central stations and in industrial power plants, the equipment described en-

## **REMOTE CONTROL** *Sperry's* **HYDRAULIC** **"EXACTOR CONTROL"**

assures

the smallest movement being  
transmitted over long distances  
**without backlash**

Installation simple, quick, economical

Engine Fuel Injection  
Governor Setting  
Reverse Gear Oper. Mechanism  
Electric Generators, etc.  
*controlled from a central station*  
(loads up to 100 in. lbs.)

**SINGLE TUBE REPLACES:**  
Cables, Turnbuckles  
Pulleys, Bellcranks  
Push Rods, etc.

*Sperry Bulletin 78-C Gives Details*

**SPERRY PRODUCTS, INC. • HOBOKEN, N. J.**



ables power producers to effect substantial economies in system regulation and, at the same time, improve the quality of service they give the consumer.

Because of the ever-increasing interconnections of generating units, stations, and systems, frequency control has become a vitally important factor in overall system regulation. And whether frequency is regulated automatically or by hand, Micromax instruments provide the reliable frequency measurements which are essential as a guide . . . and permanent records which show trends to operators and which can be filed for reference.

To receive a copy of this new book, ask Leeds & Northrup Company, 4934 Stenton Avenue, Philadelphia, Pa., for Catalog N-57-161.



## Latest Diesel Patents

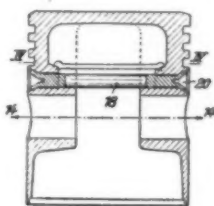
*A description of the outstanding patented inventions on Diesel and Diesel accessories as they are granted by the United States Patent Office. This information will be found a handy reference for inventors, engineers, designers and production men in establishing the dates of record, as well as describing the important Diesel inventions.*

Conducted by C. CALVERT HINES\*

2,296,388  
PISTON

Wilhelm Kramer, Neckarsulm, Wurttemberg, Germany, assignor to American Lurgi Corporation, New York, N. Y., a corporation of New York

Application November 27, 1939, Serial No. 306,421  
in Germany November 2, 1938  
8 Claims. (Cl. 309-11)



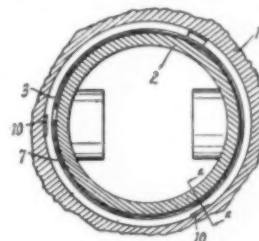
1. A light metal piston for internal combustion engines comprising a head, an annular

Patent Attorney, 811 E. Street, N.W., Washington, D. C.

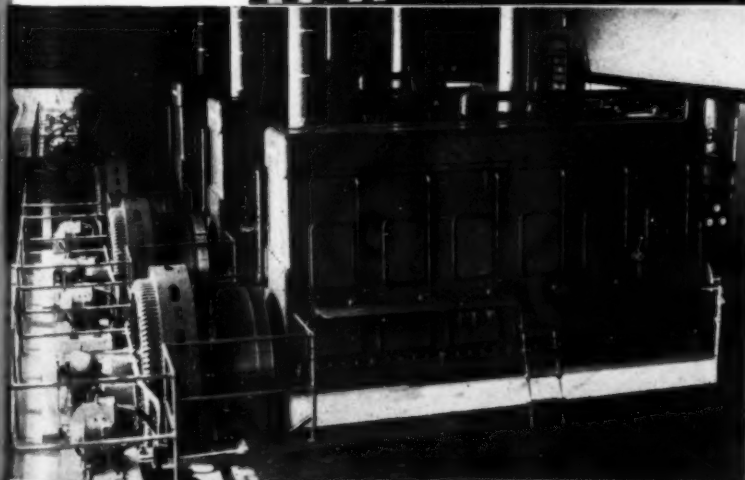
part extending from said head, and a skirt of oval cross section extending below said annular part, said piston having a slot therein located in a plane transverse to the longitudinal axis of the piston between the annular portion and the skirt, said skirt having means to receive a wrist pin and means, symmetrical with respect to the longitudinal plane of the piston containing the axis of the wrist pin receiving means, and parallel to the axis of said wrist pin receiving means, connecting the opposite sides of said skirt, said last means comprising a strap of a material having such a coefficient of expansion as to prevent deformation of the skirt beyond a predetermined amount when the piston is subjected to a predetermined temperature.

2,297,112  
PISTON RING

Harold P. Phillips, Hastings, Mich., assignor to Hastings Manufacturing Company, Hastings, Mich., a corporation of Michigan  
Application August 5, 1939, Serial No. 288,553  
1 Claim. (Cl. 309-45)



A split piston ring element adapted to be disposed in a piston ring groove for engagement.



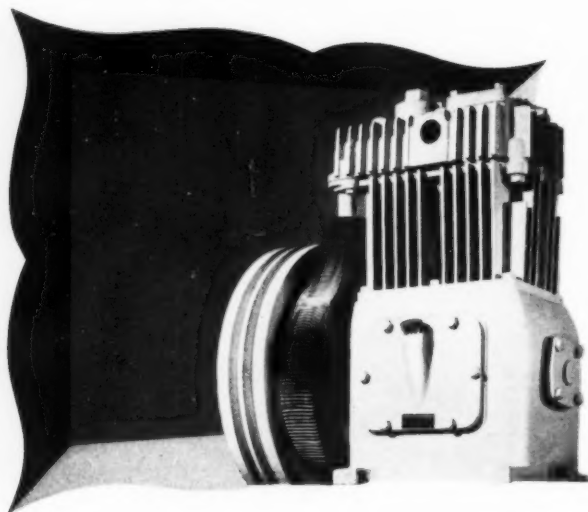
# BUCKEYE Diesels

AT WARROAD, MINNESOTA

The Border Counties Power Cooperative now has electrical energy to serve the isolated farm homes in three Counties along the Canadian Border in Northern Minnesota. Three Buckeye Diesels of 504 hp. each have brought urban comforts and conveniences to the aggressive farm families who work this lonely stretch of land — unfailing, economical power is now theirs. Buckeye will be ready to equip many more such communities when the Victory is won.

ENGINE BUILDERS SINCE 1908

Be Profitwise and Dieselize with Buckeyes  
THE BUCKEYE MACHINE COMPANY . . . . LIMA, OHIO



## Masterpiece

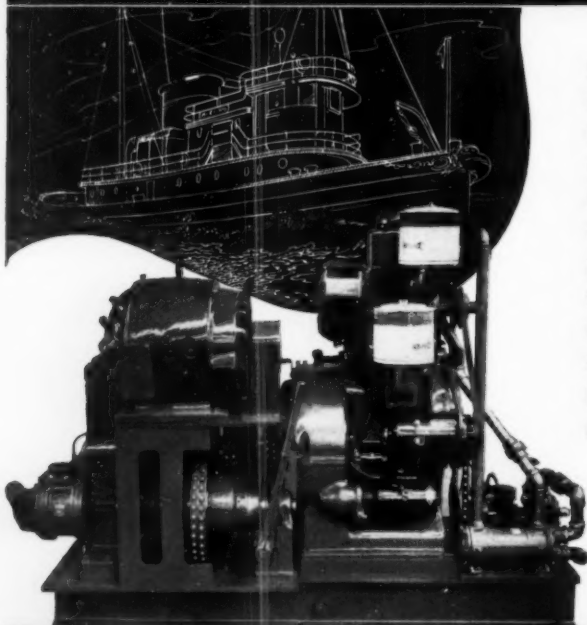
### OF MECHANICAL EFFICIENCY

Improved mechanical features combined with modern design give Quincy Compressors greater over-all efficiency. Cooling area is increased 12%. Construction is simplified. Lubrication is more thorough... more positive. Quincy builds air compressors *exclusively*. This policy of specialization has made the name QUINCY a symbol for dependability. Quincy Compressors provide air for Diesel starting and other services requiring intermittent pressures up to 500 lbs. per sq. inch. *If you have compressed air problems, let us help you solve them!*

**Quincy**  
COMPRESSORS

QUINCY COMPRESSOR CO., Dept. K-1, Quincy, Illinois

## NOW—A SHEPPARD DIESEL MARINE AUXILIARY UNIT



As COMPLETE and COMPACT a Diesel Marine auxiliary unit as was ever assembled. A SHEPPARD, single cylinder, four cycle, all American full Diesel with every accessory required for safe, dependable operation, including fresh water cooling, a 50 g.p.m. fire and bilge pump, air compressor, and a 3 kw. generator with clutch and belt transmission—all mounted on a common base—ready to run.

Write, wire, or telephone for full particulars.

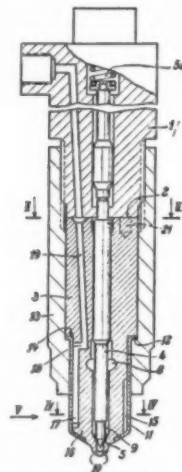
**R. H. SHEPPARD COMPANY**  
HANOVER • PENNSYLVANIA

ment with a cylinder wall, said element having a recess of substantial circumferential width having radial sides formed in the peripheral cylinder wall engaging surface thereof to permit metering of a predetermined quantity of oil therethrough in operation and the ends of said element being spaced approximately 1/16 to 5/16 inch when operatively compressed and inserted in a cylinder to supplement the metering action of said recess.

2,297,421

#### COOLED INJECTION NOZZLE

Karl Lorenz, Stuttgart, Germany; vested in the Alien Property Custodian  
Application April 5, 1940, Serial No. 328,131  
In Germany April 28, 1939  
3 Claims. (Cl. 299-107.6)



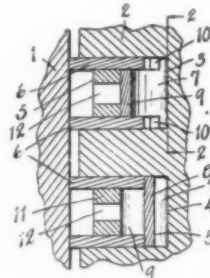
1. A cooled injection nozzle for internal combustion engines, comprising a body member having a lower recessed portion, a cooling jacket surrounding said lower recessed portion of the body member to form a hollow space for the reception of a coolant, a portion of said body member being substantially oval in cross-section with three arcuate surfaces forming sides, one of said sides comprising a narrow blunt portion, said body member contacting and forming a seal with the inner face of said jacket over the entire height of the hollow space only at said narrow blunt portion thereof, and a groove in said narrow blunting portion of the body member for supplying coolant.

2,297,104

#### PISTON RING

Aben E. Johnson, Hastings, Mich., assignor to Hastings Manufacturing Company, Hastings, Mich., a corporation of Michigan  
Application February 21, 1940, Serial No. 320,003

4 Claims. (Cl. 309-45)



1. A composite piston ring assembly comprising a pair of thin split expander cylinder walls engaging elements of wear resisting material, a combined expander and spacer element formed of ribbon steel and having a plurality of spaced outwardly bowed expander

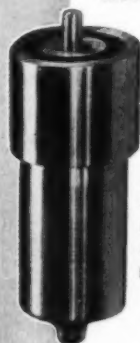


PRECISION BUILT

# DEMCO

## FUEL INJECTION EQUIPMENT

Demco design, manufacture and test are based on the ultra-precise requirements of effective Diesel fuel injection. Demco fuel injection units are characterized by compactness and clean, simple design, highest quality materials, superb workmanship.



### Demco Fuel Nozzle

Nozzles are made in three sizes, with flat seated needles of standard or non corrosive materials. No. 4 nozzle is self-cooling.



### Demco Fuel Injector

Fuel injectors are hydraulically operated, differential, closed type and are made in various lengths with three standard shank diameters.



### Demco Fuel Injection Pumps

"PH" fuel injection pumps are port controlled type; they are adaptable to a wide range of Diesels with minor adjustment of timing.

Send specifications with inquiries

**DIESEL ENGINEERING & MANUFACTURING COMPANY**

280-214 N. LAFLIN ST., CHICAGO, ILLINOIS

reaches engageable with the inner edges of said cylinder wall engaging elements and having a plurality of outwardly bowed spacer reaches alternating with said first named reaches and of substantially greater radial height, said spacer reaches being of axial width equal to the spacing of said cylinder wall engaging elements to engage between said cylinder wall engaging elements and constitute spacers therefor, said spacer reaches being joined at each side thereof to said expander reaches by inwardly bowed reaches constituting thrust reaches for engagement with the bottom of a piston ring groove in which the assembly is installed.

2,296,558

### LIQUID FUEL FOR INTERNAL COMBUSTION ENGINES

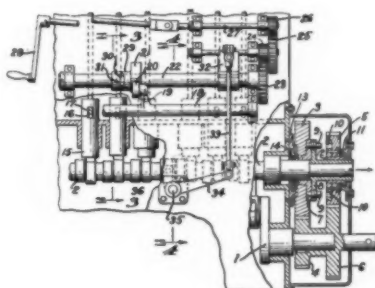
Vaman R. Kokatnur, New York, N. Y., assignor to Autoxygen, Inc., New York, N. Y., a corporation of New York  
No Drawing. Application September 29, 1938, Serial No. 230,815  
11 Claims. (Cl. 44-57)

7. A liquid fuel suitable for internal combustion engines, particularly of the Diesel type, comprising an organic combustible material of high flash and high boiling point and a true peroxidic compound of fatty acids containing at least 10 carbon atoms, which is soluble in the said oil.

2,297,376

### INTERNAL COMBUSTION ENGINE

Clinton L. Walker, Piedmont, Calif.  
Application May 1, 1939, Serial No. 271,092  
15 Claims. (Cl. 123-97)



1. In combination with an internal combustion engine of the four-stroke cycle type, means for changing the engine operation from a four-stroke cycle internal combustion engine to a two-stroke cycle compressor by simultaneously raising the tappets and shifting the cam shaft of the engine axially and thereafter lowering the tappets.

2,297,113

### PISTON RING

Harold P. Phillips, Hastings, Mich., assignor to Hastings Manufacturing Company, Hastings, Mich., a corporation of Michigan  
Application June 10, 1940, Serial No. 339,642  
5 Claims. (Cl. 309-44)



1. A piston ring assembly comprising an annular split main cast iron member of approximately rectangular section having a circumferential groove formed on the outer periphery thereof and extending substantially into the member, and a thin split element of lubricating metal disposed in said groove, said element being uniformly dished in outline throughout and the inner and outer sides thereof initially engaging the cylinder wall and bottom of the

FOR LUBRICATING  
OIL PURIFYING

# Specify HILCO

A complete line of lube oil purifiers using Fullers Earth - cotton waste and specially prepared filtering agents.

### HILCO OIL RECLAIMERS



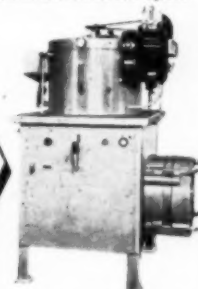
A simple, economical and foolproof method of restoring contaminated oil to the full value of new oil, - for direct connecting to one or more Diesel engines for continuous or intermittent operation.

### HILCO HYFLOW OIL FILTERS



A superior oil filter for perfect filtering of Diesel engine lube oil - for direct-connecting to one or more engines - continuous or intermittent operation.

### HILCO AIRLINE OIL PURIFIERS



A perfect method for contact oil purifying for complete oil reconditioning. For batch purifying directly from engine lube oil system or transfer tanks.

The HILCO line offers you a complete lubricating oil purifier service. Write for free literature and see what HILCO operators are doing - then let us help you select a HILCO to take care of "That Particular Job".

### OIL PURIFIER HEADQUARTERS

## THE HILLIARD CORP.

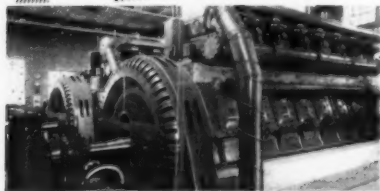
122 W. 4TH. ST., ELMIRA, N.Y.



**FABRICATED TO YOUR SPECIFICATIONS**

Find out today how Naylor's engineering service can help you meet your exhaust and intake pipe requirements—no matter how complicated. Naylor's complete fabrication service will bring you light-weight, steel-saving, money-saving pipe to meet your exact specifications.

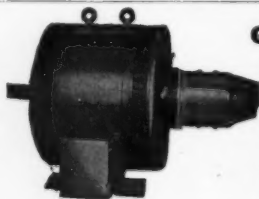
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**Naylor**  
NAYLOR PIPE COMPANY  
1265 EAST 92nd STREET  
CHICAGO, ILLINOIS

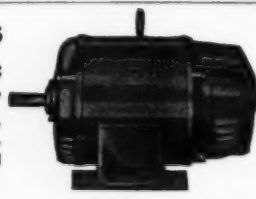
**SAFETY CONTROLS  
ALARM SYSTEMS  
TACHOMETERS  
FOR DIESEL ENGINES**  
VIKING INSTRUMENTS, INC.  
Stamford, Connecticut

**GASKETS for DIESELS**  
Serving The United Nations  
STEELBESTOS • TWIN-TYPE STEELBESTOS • KORKOID  
SPRINGOID • DELOID • SYNTHETIC COMPOSITIONS  
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**GENERATORS**  
AC and DC  
3 to 150 kw.  
For Diesel and  
gasoline en-  
gine drive

**MOTORS**  
AC and DC  
¼ to 200 hp.  
For all appli-  
cations Sta-  
tionary and  
Marine



**STAR generators and motors are extensively used in both stationary and marine service. STAR gear motors are made in both planetary and worm gear types with and without integral brakes.**

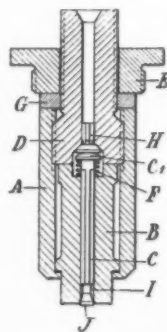
**STAR ELECTRIC MOTOR CO. BLOOMFIELD, NEW JERSEY**

groove in installed position, the axial dimension of said groove being somewhat less than the over-all axial dimension of the element whereby a frictional gripping action is exerted on the groove walls to maintain the element in place, the space in the groove not occupied by the element constituting an oil reservoir for the accumulation and maintenance of a continuous annular supply of oil adjacent the cylinder wall, said main member being further annularly recessed adjacent and communicating with said groove.

2,297,487  
**INJECTOR FOR INTERNAL COMBUSTION ENGINES**

Prosper L'Orange, deceased, late of Stuttgart, Germany, by Rudolf L'Orange, executor, Stuttgart, Germany; vested in the Alien Property Custodian

Application April 27, 1940, Serial No. 332,108  
In Germany September 6, 1938  
1 Claim. (Cl. 299-107.6)



An injector for light fuels comprising a nozzle having an axial bore through which fuel to be injected is delivered under pressure, said bore including an upper portion, an intermediate portion of enlarged diameter communicating with said upper portion, and a lower guide portion communicating with said intermediate portion; a valve seat adjacent the juncture between said upper and intermediate portions; a non-return valve cooperating with said valve seat to control the flow of fuel from the upper portion to the intermediate portion of the bore; a piston valve slidably mounted within said guide and intermediate portions and including a passage through which fuel may flow from said intermediate portion to the lowermost end of said guide portion, said piston valve having a head at its upper end disposed within the intermediate portion of the bore and beneath the non-return valve positioned within said portion, and said piston valve having a valve surface at its lower end for controlling the flow of fuel from the lowermost end of the bore; and a compression return spring within said intermediate portion of the bore and beneath said head to main-

**TUTHILL**



**THE COOLANT PUMP**  
that laughs at  
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There are good reasons why the Tuthill Model M Coolant Pump is outstanding in wartime production. Compactly built, this positive displacement internal-gear rotary pump is designed with an exclusive safety feature that assures long, dependable, uninterrupted service.

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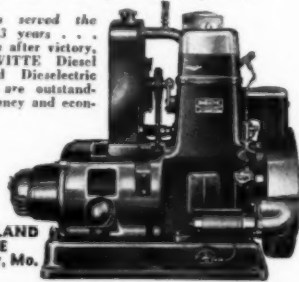
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tain said head in contact with said non-return valve to maintain said valve in contact with said valve seat and to maintain said valve surface in position to prevent the flow of fuel from the lowermost end of the bore until said non-return valve is subjected to a sufficient, predetermined fuel pressure to overcome the force exerted by said spring.

2,296,357

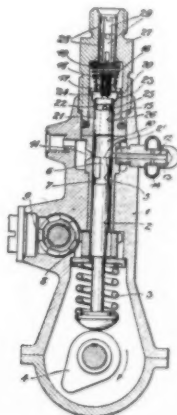
### FUEL INJECTION PUMP FOR INTERNAL COMBUSTION ENGINES

Heinz Links, Samuel Meiswinkel, and Karl Schwaiger, Gaggenu, Germany; vested in the Alien Property Custodian

Application July 10, 1939, Serial No. 283,610

In Germany July 12, 1938

28 Claims. (Cl. 123-139)



1. A fuel injection pump having a pump housing provided with a cylinder space including a pump chamber, and a pump piston reciprocal within said cylinder space, a delivery conduit, a slidable control member intermediate said pump chamber and said delivery conduit, having a passage adapted to connect the pump chamber with the delivery conduit and which is opened or closed dependent upon the position of said control member, said control member being subjected to and movable in accordance with the pressure produced in said pump chamber in such a manner that it substantially follows the reciprocal movement of said piston to open and close said passage, and means for varying the initial setting of said control member relatively to said piston to vary the time of opening and closing said passage relatively to the position of said piston.

2,297,399

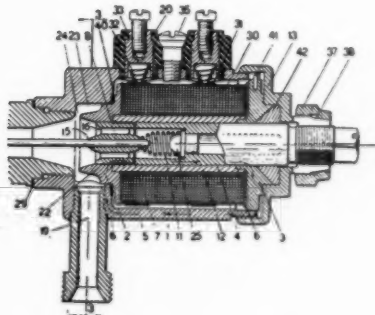
### INTERNAL COMBUSTION ENGINE FUEL INJECTOR

Ottavio Fuscaldo, Milan, Italy; vested in the Alien Property Custodian

Application November 21, 1939, Serial No. 305,419

In Italy January 20, 1939

5 Claims. (Cl. 137-139)



1. An internal combustion engine injection apparatus of the kind recited having an elongated liquid fuel pressure chamber and an im-

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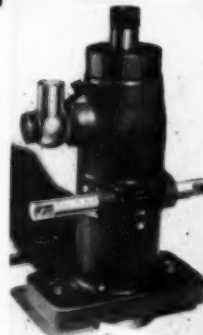
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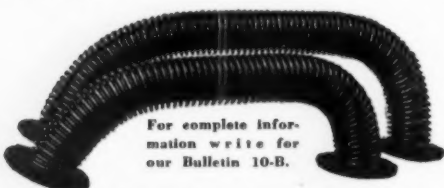


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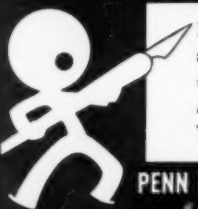
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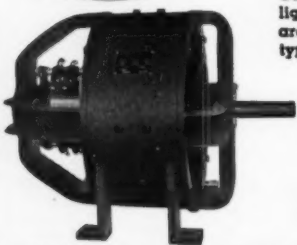
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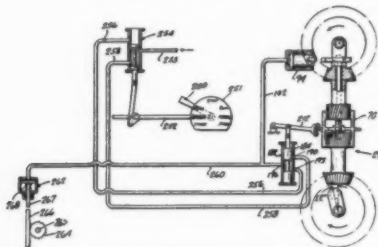


mersed valve and stem reciprocable longitudinally within the chamber with a short stroke of retraction against resilient return, in combination with electromagnetic means operable to retract and then release the valve stem, the same comprising a solenoid coil with a two-part iron core therein, one core part constituting an annular head fast on said stem and movable in the liquid therewith and of open construction for free liquid flow whereby it may shift without substantial obstruction from the liquid, the stem and head by their short stroke being adapted to leave a short magnetic gap between the two core parts in one position and to close such gap in the other position, and other iron parts constituting with said core parts a magnetic circuit disposed around said coil, said other iron parts comprising an outer housing wall, and inward extensions therefrom to the movable and the other core part respectively; said outer wall having a longitudinal extension beyond the movable core part formed with a liquid inlet, whereby a substantially stagnant space is left between said inlet and the core parts.

2,292,104

REVERSIBLE OPPOSED PISTON ENGINE  
Hans Davids, Beloit, Wis., assignor to Fairbanks, Morse & Co., Chicago, Ill., a corporation of Illinois.

Application March 17, 1941, Serial No. 383,681  
15 Claims. (Cl. 123-41)



15. In a reversible engine of opposed piston type, having spaced crankshafts, the combination of a rotation synchronizing drive connection for said crankshafts, said connection including shaft elements each operatively connected to one of the crankshafts and a coupling device interconnecting said shaft elements, said coupling device being operable during reversals of engine operation, to effect a limited relative rotation of the shaft elements, whereby to



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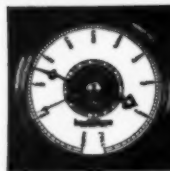
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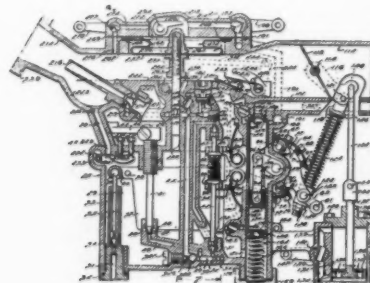
adjust the phase relationship of said crank shafts such that one thereof leads the other by a predetermined angle in both the forward and reverse operations of the engine, engine fuel supply means, engine reversing control means in controlling association with said coupling device and fuel supply means, operable during engine reversal, to cause crankshaft phase adjusting operation of the coupling device and to render said fuel supply means ineffective for supplying fuel to the engine, and means operated by said coupling device during its crankshaft phase adjusting operation, effective when said coupling device completes its phase adjusting operation, for terminating operation of said reversing control means.

2,292,493

### FUEL SYSTEM FOR COMBUSTION ENGINES

Homer A. Trussell, Bombay, India  
Application January 22, 1940, Serial No. 314,950

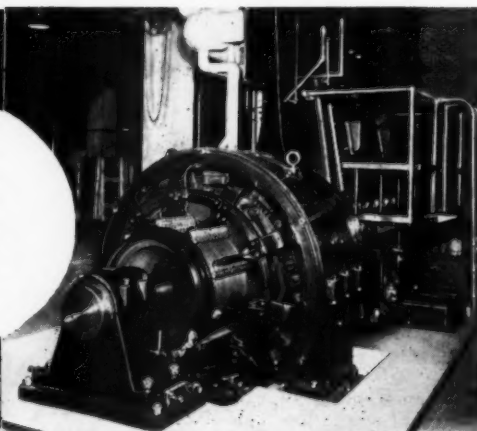
6 Claims. (Cl. 261-69)



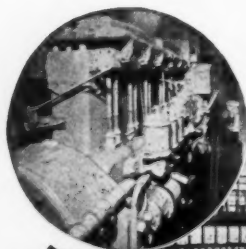
1. In a charge forming device having a primary conduit with a throttle valve therein for delivering a supply of working fluid to an internal combustion engine and having a closed fuel supply chamber, valve means for controlling the supply of fuel from said closed fuel supply chamber to said conduit for forming a working fluid in said conduit, a diaphragm for controlling said valve means means for exposing one side of said diaphragm to the pressure existing in said conduit between said throttle valve and said engine, and means for exposing the opposite side of said diaphragm to the pressure existing in said closed fuel chamber.

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